NPJSC «Kazakh National Research Technical University named after K. I. Satbayev»
Institute of Architecture and Construction named after T.K. Basenov
Department of "Architecture"

CURRICULUM PROGRAM

7M07305 – «BIM-technologies in architecture and construction»
(profile direction (1.5 years)

Master of Engineering and Technology on the curriculum program 7M07305 – «BIM-technologies in architecture and construction»

1st edition
in accordance with the GOSO of higher education 2018

Almaty 2020

The program is drawn up and signed by the parties:

From KazNRTU named after K. I. Satbayev:

1. Head of the Department "Architecture» _____ Hodzhikov A. V.
2. Head of department "Construction and building materials» _____ Kasymbaev N.K.
3. Head of department "Engineering systems and networks» _____ Alimova K. K.
4. Director of Institute _____ Kuspangaliev B. U.
5. The chairmen of the UMG departments _____ Maulenova G. D.
   _____ Nashiraliev J. T.
   _____ Unasbekova B.A.

From employers:

1. Co-Chairman of the Advisory Board of the Institute, deputy Director OC «KA Stroy Ltd» _____ Karmanov Sh. D.
2. Co-Chairman of the Advisory Board of the Institute, deputy Director Too NIC "ECO Abalou» _____ Zhumartova A. E.

From partner University:

Head of department ""Construction materials and technologies" of Karaganda state technical University _____ Rakhimova G. M.

Approved at the meeting of the Educational and methodical Council of the Kazakh national research technical University named after K. I. Satpayev. Protocol No. 4 of 14.01.2020 y.

Qualification:
Level 7 of the National qualifications framework:
7M07 Engineering, manufacturing and construction industries:
073 Architecture and construction:
7M07305 – "BIM technologies in architecture and construction»
Professional competence:
Graduate master can work as a designer, project Manager, to carry out management activities in the field of architecture, construction and engineering systems of buildings and structures in the modern environment of information modeling (project BIM-management).

Short description of the program:

1. Purposes

Preparation of masters of technical Sciences in the specialty 7M07305 – "BIM-technologies in architecture and construction" – training of specialists with a high level of professional culture, having a civil position, able to formulate and solve scientific and practical problems, to carry out design, management and research activities.

The objectives of the educational program are presented in table 1.

Таблица 1. Цели образовательной программы

Target code	Statement of purpose
Ц1	Understanding the methods of research and preparation of tasks for the design of the object. The solution of modern scientific and practical problems. Practical use of the methodology of digital modeling of buildings and structures.
Ц2	In-depth understanding of structural design, construction and engineering issues related to building design. The development of fundamental courses at the intersection of Sciences that guarantee their professional mobility.
Ц3	Adequate knowledge of physical problems and technologies, as well as the functions of buildings in order to ensure their conditions of internal comfort and protection from climatic influences. Theoretical and methodological basis for the formation of sustainable architecture.
Ц4	Mastering the design skills necessary to meet customer requirements within the constraints imposed by cost factors and building regulations. Accounting for the results of architectural research.
Ц5	Knowledge of the industries, organisations, regulations and procedures for translating design concepts into buildings and integrating plans into overall planning, based on the data of survey works.
Ц6	Preparation of graduates for self-study and development of new professional knowledge and skills, continuous professional self-improvement, the formation of new professional thinking. Preparation for independent scientific research, readiness for analytical work.

2. Types of professional activity

Graduates of the master's degree can perform the following professional activities:
- design work in the field of architecture, urban planning, construction, engineering systems and networks in the BIM environment;
- administrative and managerial activities in the bodies of architecture and urban planning under the city and regional akimats.

3. Sphere of professional activity:

- management activities in the structural units of the Department of architecture and urban planning of the district, city and regional level, regional and district akimats, in the design formations of various forms of ownership in the field of architecture, urban planning, construction, engineering systems and networks.

4. Objects of professional activity:

- architectural and town-planning objects: territories of the cities and suburban zones, rural settlements with adjacent territories, territories of separate administrative areas, territories of village councils, parts of territories of settlements allocated on socially significant signs;
- architectural and construction objects: buildings, constructions, their complexes of residential, public, industrial, industrial purpose, interiors of buildings and constructions;
- components of architectural and town-planning objects: building constructions and materials, engineering systems and networks;
- architectural and landscape objects: landscaped, landscaped, watered, equipped land; objects of transport and engineering infrastructure.

5. Subject of professional activity:

- solution of issues of design of residential and public buildings, structures and their complexes by means of BIM-design and management;
- functional organization of structural solutions used building materials designed, under construction and in operation;
- complex organization of engineering solutions of designed, constructed and in operation objects;
- study of experience in the design of populated areas, civil buildings, structures and promotion of achievements in the architectural and construction sphere.

PASSPORT OF THE EDUCATIONAL PROGRAM

1 Scope and content of the program

The period of study in the master's degree is determined by the volume of mastered academic credits. When mastering the set amount of academic credits and achieving the expected results of training for a master's degree, the educational program of the master's degree is considered to be fully mastered. The profile of the magistracy at least 92 academic credits for the entire period of study (1.5 years), including all types of educational and scientific activities of undergraduates.

Planning the content of education, the method of organization and conduct of the educational process is carried out by the University and the scientific organization on their own on the basis of credit technology training.

The content of the master's educational program consists of:

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

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

3) design and research work, including the implementation of a comprehensive master's project by means of BIM-technologies;

4) final certification.

The content of the EP

When implementing the educational program of the specialty of postgraduate education 7M07305 – "BIM-technologies in architecture and construction" , a credit-modular system of educational process organization is used, based on the modular principle of presenting the content of the educational program and building curricula, using a system of credits (credits) and appropriate educational technologies.

Educational program 7M07305 – "BIM in architecture and construction" contains:

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

2) additional types of training – different types of practices, experimental research/research work;

3) midterm and final certification.

Implementation of educational programs is carried out on the basis of educational and methodical complexes of specialty and disciplines.

The total complexity of theoretical training is determined by the list of subjects studied, given in the Working curriculum.

The main criterion for the completion of the educational process for the preparation of masters is the development of undergraduates:
- at profile preparation – not less than 92 credits (ECTS), from them not less than 52 credits of theoretical training, not less than 28 credits of practice; development and defence of master's work – 12 credits.
One academic credit is equal to 30 academic hours of the following types of academic work:
- classroom work of a graduate student during the academic period in the form of a semester;
- work of a master student with a teacher during the period of professional and research practices;
- work of a master's student with a teacher during the research work (experimental research) of a master's student;
- works of the master's student on preparation and defence of the master's project;
- the work of a student on the preparation and delivery of a comprehensive examination.
Previous level of education: higher education.

Objectives of the educational program

The main objectives of the educational master's program in the specialty 7M07305 – "BIM-technology in architecture and construction" are:
- choice of individual direction of education;
- deepening of theoretical and practical individual training in the field of architecture, urban planning, construction and related Sciences, due to the needs of the state and the market, scientific and practical activities of educational institutions that train masters;
- acquisition of skills in the organization and conduct of research, obtaining the necessary groundwork for the continuation of scientific work in doctoral studies;
- development of the ability to self-improvement and self-development, needs and skills of independent creative mastery of new knowledge throughout their active life.

2 Requirements for applicants

Previous level of education of entrants – higher professional education (bachelor). 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 degree is established in accordance with the "Standard rules for admission to educational institutions that implement educational programs of postgraduate education."

The formation of the contingent of undergraduates is carried out through the placement of the state educational order for the training of scientific and pedagogical

personnel, as well as payment for training at the expense of citizens ' own funds and other sources. Citizens of the Republic of Kazakhstan shall be provided with the right to receive free postgraduate education on a competitive basis in accordance with the state educational order, if they receive this level for the first time.

At the "entrance" the master student must have all the prerequisites necessary for the development of the appropriate educational program of the magistracy. The list of necessary prerequisites is determined by the higher education institution independently.

In the absence of the necessary prerequisites undergraduates are allowed to master them on a fee basis.

3 Requirements for completion of studies and diploma

Degree / qualifications awarded

The graduate of this educational program is awarded the academic degree "master of engineering and technology" in the direction.

A graduate who has mastered the master's program, must have the following – the ability to independently acquire, comprehend, structure and use in professional activity new knowledge and skills, to develop their innovative abilities;

– the ability to independently formulate research goals, establish the sequence of professional tasks;

– the ability to apply in practice knowledge of fundamental and applied sections of disciplines that determine the direction (profile) of the master's program;

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

– ability to critically analyze, present, protect, discuss and disseminate the results of their professional activities;

– possession of skills of drawing up and registration of scientific and technical documentation, scientific reports, reviews, reports and articles;

– willingness to lead the team in the field of their professional activities, tolerant of social, ethnic, religious and cultural differences;

– readiness for communication in oral and written forms in a foreign language to solve the problems of professional activity.

Graduate, master's degree program majoring in 7M07305 – "BIM in architecture and construction", must have the professional competencies, relevant professional activities, which are the focus of the graduate program:

– *research and production activities:*

– the ability to use modern methods of processing and interpretation of complex information (BIM-technology) to solve production problems;

– the ability to independently carry out calculations in the selection of design schemes and the definition of engineering designed, under construction and in operation objects;

– the ability to independently carry out production and research and production field, laboratory and interpretation work in solving practical problems;

– ability to professional operation of modern field and laboratory equipment and devices in the field of master's degree program;

– *project activity:*

– the ability to independently prepare and submit projects of research and production works;

– readiness to design complex research and production works in solving professional problems by means of BIM-technologies;

– *organizational and management activities:*

– ready to use practical skills of organization and management of scientific-research and scientific-production work, the use of possibilities of BIM technology in the solution of professional tasks;

– readiness for practical use of normative documents in the planning and organization of scientific and production works.

When developing a master's program, all General cultural and General professional competences, as well as professional competences related to the types of professional activity for which the master's program is focused, are included in the set of required results of the master's program.

4 Working curriculum of the educational program

4.1. Duration of training 1.5 years

WORKING CURRICULUM
of the Educational program «BIM-technologies in architecture and construction»
on the basis of the following majors of the invalid Classifier of specialties: 6M042000– «Architecture», 6M0729000 – «Construction», 6M075200 «Engineering systems and networks»

Degree: Master of engineering and technology

Duration of training: 1,5 year

Year of study	Code	Name of discipline	Component	Credits		lec/lab/pra	Prerequisites	Code	Name of discipline	Component	Credits		lec/lab/pra	Prerequisites
				ECTS	RK						ECTS	RK		
	1 semester							2 semester						
1	LNG201	English language (professional)	BD	5	3	0/0/3		ARC234	BIM-management	PD	5	3	0/0/3	
	MNG230	Project management	BD	3	2	1/0/1		ARC235	Fundamentals of information modeling	PD	5	3	0/0/3	
	1101	Elective course	BD OC	5	3	1/0/2		1205	Elective course	PD OC	5	3	2/0/1	
	1102	Elective course	BD OC	4	2	1/0/1		1206	Elective course	PD OC	5	3	2/0/1	
	1103	Elective course	PD OC	5	3	2/0/1		1207	Elective course	PD OC	5	3	2/0/1	
	1104	Elective course	PD OC	5	3	2/0/1		AAP207	Experimental and research work of undergraduate student	ERW	6	4		
	AAP207	Experimental and research work of undergraduate student	ERW	6	4									
		Total:		**33**	**20**				**Total:**		**31**	**19**		
2	3 semester													
	AAP207	Experimental and research work of undergraduate student	ERW	6	4									
	AAP208	Internship	PD	10	6									
	ECA501	Registration and defense of the master's thesis	FC	12	7									
		Total:		**28**	**17**									
		TOTAL:		**92**	**56**									

THE CATALOG OF ELECTIVE DISCIPLINES
of the Educational program "BIM-technologies in architecture and construction» on the basis of the following majors of the invalid Classifier of specialties: 6M042000– "Architecture", 6M0729000 – "Construction», 6M075200 "Engineering systems and networks»

Degree: Master of engineering and technology

Duration of training: 1,5 year

Code of electives in the curriculum	Code	Name of disciplines	Cycle	Credits	lec/lab/pra	Semester
1101	ARC208	Methodology in energy efficiency architecture	BD	3	2/0/1	1
	ARC148	Regulatory and regulatory framework in architecture and urban planning				1
1102	CIV244	Theory of elasticity and plasticity	BD	3	2/0/1	1
	CIV208	Dynamics of structures				1
1103	ARC208	Methodology in energy efficiency architecture	PD	3	1/0/2	1
	ARC223	Energy efficiency in urban planning				1
1104	CIV246	Seismic resistance of buildings and structures	PD	3	2/0/1	1
	CIV207	Geotechnics-state and development prospects				1
1205	HYD266	Modern methods and technologies of engineering systems	PD	3	2/0/1	2
	HYD267	Special issues of heat supply in construction				2
1206	HYD268	Rational use of heat and gas in construction	PD	3	2/0/1	2
	HYD216	Start-up and adjustment of water supply and sewerage facilities				2
1207	ARC227	Methods of design in BIM-technology	PD	3	1/0/2	2
	ARC228	Professional computer technologies				2
		Total:		**21**		

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

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

The results of training are formulated at the level of the entire educational program of the magistracy, and at the level of individual modules or discipline.

Descriptors reflect the learning outcomes characterizing the learner's abilities:

1) demonstrate developing knowledge and understanding in the field of architecture, urban planning, construction, engineering systems and networks, based on advanced knowledge, in the development and (or) application of ideas in the context of design and research activities;

2) apply professionally their knowledge, understanding and abilities 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 to both professionals and non-specialists;

5) training skills necessary for self-continuation of further training in the field of architecture, urban planning, construction, engineering systems and networks.

6 Competences on completion of training

6.1 Requirements to key competences of graduates of profile magistracy. Upon completion of the training, the master should:

1) have an idea about:

– the role of science and education in public life;

– contradictions and socio-economic consequences of globalization processes;

– philosophy and methodology in the architectural and construction sphere, the state and trends of architecture, urban planning, construction, engineering systems and networks in the Republic of Kazakhstan, CIS and foreign countries.

2) know:

– the latest achievements in the field of architecture and construction;

– possibilities of computer technologies (BIM-technologies), applied problems of architecture, modern mathematical and natural-science research methods used in the architectural and construction sphere;

– the main trends in the development of the architectural and construction sector in Kazakhstan, CIS and foreign countries.

3) be able:

– critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena;

– integrate the knowledge gained in different disciplines to solve research problems in new unfamiliar conditions;

– by integrating knowledge to make judgments and decisions based on incomplete or limited information;

– to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;

– creative thinking and creative approach to solving new problems and situations;

– fluent in a foreign language at a professional level;

4) have skills:

– use of modern information technologies in the educational process;

– professional communication and intercultural communication;

– oratory, correct and logical design of their thoughts in oral and written form;

– development of design and estimate documentation of buildings, constructions and their complexes, landscape and town-planning objects, monuments of architecture, their constructive and engineering parts, promotion of achievements of architectural and construction activity;

– solution of issues of design of residential and public buildings, their complexes;

– functional organization of structural solutions used building materials designed, under construction and in operation;

– expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies.

5) be competent:

– in design business, in art creativity, to own professional computer programs and the basic requirements providing durability, advantage and beauty of buildings and constructions, to be guided freely in the solution of architectural, construction and engineering tasks;

– in ways to ensure constant updating of knowledge, expanding professional skills and abilities in the field of BIM-technologies.

6.2 Composition of master's competences

The development of the master's educational program should ensure the formation of the following groups of competencies:

academic competencies – advanced scientific-theoretical, methodological knowledge and research skills, providing the development of research projects or solving problems of scientific research, innovation, continuous self-education;

social and personal competences – personal qualities and abilities to follow social and cultural and moral values; abilities to social, intercultural interaction, critical thinking; social responsibility, allowing to solve social and professional, organizational and administrative, educational tasks;

professional competence – in-depth knowledge of special disciplines and abilities to solve complex professional problems, tasks of research and scientific-pedagogical activity, to develop and implement innovative projects, to carry out continuous professional self-improvement.

Requirements for master's academic competences. The master must:

S&PC-1. To be able to take into account social, moral and ethical standards in social and professional activities.

S&PC-2. Be able to cooperate and work in a team.

S&PC-3. Possess communication skills to work in an interdisciplinary and international environment.

Requirements for professional competencies of the master. A master must be able to:

Project activity

PC- 8. Formulate design tasks.

PC-9. Apply methods of analysis of options, development and search for compromise solutions.

PC-10. Use automation tools in the design, constantly master new achievements in the field of automation, actively use BIM-technology.

Organizational and management activities

PC-11. To make the best management decisions.

PC-12. To master and implement management innovations in architectural and construction activities.

Innovative activity

PC-13. To carry out a feasibility study of innovative projects.

PC-14. To develop normative and methodical documents in architecture, engineering and construction.

PC-15. Use modern computer technologies to solve engineering and innovative problems of professional activity.

6.3 Requirements for research work of a master's degree student in a profile master's degree:

1) corresponds to the profile of the educational program of the master's degree, which is performed and protected by a comprehensive master's thesis;

2) relevant and contains scientific novelty and practical significance;

3) based on modern theoretical, methodological and technological achievements of science and practice;

4) performed using modern methods of scientific research;

5) contain research (methodical, practical) sections on the basic protected provisions;

6) based on international best practices in the relevant field of knowledge;

7) make use of advanced BIM technology.

6.4 Requirements for the organization of practices:

The educational program of the profile magistracy includes two types of practices that are conducted in parallel with theoretical training or in a separate period:

1) research in the cycle of PD – at the place of performance of master's work.

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

7 Annex to the certificate according to the standard ECTS

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

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

Foreign language (professional)

CODE – LNG202
CREDIT – 6 (0/0/3/3)
PREREQUISITE – Academic English, Business English, IELTS 5.0-5.5

THE PURPOSE AND OBJECTIVES OF THE COURSE
The aim of the course is to develop students ' English language skills for their current academic studies and improve their performance in project management

BRIEF DESCRIPTION OF THE COURSE
The course aims to build vocabulary and grammar for effective communication in project management and to improve reading, writing, listening and speaking skills at the Intermediate level. It is expected that students will acquire a vocabulary of business English and learn grammar structures, which are often used in the context of management. The course consists of 6 modules. The 3rd module of the course ends with an intermediate test, and the 6th module is accompanied by a test at the end of the course. The course ends with the final exam. Students also need to practice on their own (MIS). MIS - independent work of undergraduates under the guidance of a teacher.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE
Upon successful completion of the course, students are expected to be able to recognize the main idea and message, as well as specific details when listening to monologues, dialogues and group discussions in the context of business and management; understand written and spoken English on topics related to management; write management texts (reports, letters, e-mails, minutes of meetings), following the generally accepted structure with a higher degree of grammatical accuracy and using business words and phrases, talk about different business situations, using the appropriate business vocabulary and grammatical structures - in pairs and group discussions, meetings and negotiations.

Project management

CODE – MNG230
CREDIT – 4 (1/0/1/2)
PREREQUISITE – not

THE PURPOSE AND OBJECTIVES OF THE COURSE
Training of undergraduates in the basics of project management, the expansion of their professional capabilities in terms of the application of management knowledge in the field of professional activity.

BRIEF DESCRIPTION OF THE COURSE
The discipline is aimed at preparing graduates for:
– use of quantitative and qualitative methods to manage business processes and evaluate 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;
– enterprise management; organization or institution, including institutions of higher professional education and research institutions, as well as their departments, support of business processes in different areas of management, the use of modern tools for the diagnosis of activities and development of the development strategy of the enterprise and organization;
– preparation of graduates to work in the ever-changing conditions of internal and external environment of the enterprise, the country and the world.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE
Know:
– main functions of project management;
– the use of modern methods of assessing the effectiveness of management programs, tasks, activities;
– identification, formulation and solution of production tasks, including material, human and economic parameters.

BIM-management

CODE – ARC234
CREDIT – 6 (1/0/2/3)
PREREQUISITE – ECA102

BRIEF DESCRIPTION OF THE COURSE
Decision-making on strategic issues in the implementation of BIM-technologies in the architectural and construction organization. Organization of project work in BIM environment. Project management using BIM-technologies. Analysis and management decision-making in terms of risk in project management. Eliminating conflicts when working with related specialists in the framework of creating a BIM model of a particular object. Engineering analysis to ensure the integrity of the object.

Fundamentals of information modeling

CODE – ARC235
CREDIT – 6 (1/0/2/3)
PREREQUISITE – ECA102

The study of the basics of information modeling, including the basics of parametric modeling. Methodology of using tools and information modeling tools to create BIM models in architectural design. The practice of applying the knowledge gained in the process of creating complex forms with the help of special programs. Possibilities of information modeling in the production of estimates. Flexibility and transparency of the entire process of creating an object using information modeling – from project to operation.

Professional computer technologies

CODE – ARC228
CREDIT – 6 (1/0/2/3)
PREREQUISITE – ECA102

The study and practical application of professional computer technologies used in architectural design in the creation of BIM-models. The latest technologies used in project activities. Features of complex work in information modeling. Mastering the Autodesk Revit and Autodesk Dynamo programs in practice. Three-dimensional graphic construction and systematization of the data. Practice of integrated work with related specialists on the development of BIM-model.

Design methodology in BIM technology

CODE – ARC227
CREDIT – 6 (1/0/2/3)
PREREQUISITE – ECA102

Overview of the design methodology in BIM. The concept of the information model of the building. Methodological directions in BIM-design of objects. Mastering the program Autodesk Revit and Autodesk Dynamo. Tools and techniques. Work with subcontractors. Features of creating an information model of the building. Methods of independent work and team work: information gathering, analysis, task setting, stage-by-stage work and public presentation. Methods of data exchange between all project participants.

Regulatory and regulatory framework in architecture and urban planning

CODE – ARC148
CREDIT – 4 (1/0/1/2)
PREREQUISITE – ECA102

THE PURPOSE AND OBJECTIVES OF THE COURSE
Formation of skills of legal approach to architectural and urban design in the Republic of Kazakhstan, the formation of a responsible attitude to professional communications in the practical, theoretical and expert activities of the architect, the formation of the ability to conduct independent pre-project and project work using modern methods and methods of implementation of the results of scientific and practical research in the project documentation, the study of modern methodological techniques in the design in the real urban situation, formation of skills of social responsibility of the architect.

BRIEF DESCRIPTION OF THE COURSE
It covers a range of issues related to architectural design. The course of lectures is focused on the analysis of the legal framework in the field of architectural and urban development in Kazakhstan of the modern period and the study of the history of legal regulation. Practical classes are aimed at obtaining and strengthening the skills of methods of reconstruction of historical buildings of cities and restoration of monuments of architecture, as well as methods of professional architectural and urban design within the legal framework of the Republic of Kazakhstan.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE
The process of studying the discipline is aimed at the formation of the following competencies:
– the ability to take initiative, including in situations of risk, to resolve problematic situations, to take responsibility for decisions;
– readiness for social mobility, adaptation to new situations, reassessment of experience, analysis of their capabilities, communication in the scientific, industrial and social spheres;
– the ability to interpret the results of applied research in the form of generalized design models.

Methodology in energy efficiency architecture

CODE – ARC208
CREDIT – 4 (1/0/1/2)
PREREQUISITE – ECA102

THE PURPOSE AND OBJECTIVES OF THE COURSE
Formation of skills of legal approach to architectural and urban design in the Republic of Kazakhstan, the formation of a responsible attitude to professional communications in the practical, theoretical and expert activities of the architect, the formation of the ability to conduct independent pre-project and project work using modern methods and methods of implementation of the results of scientific and practical research in the project documentation, the study of modern methodological techniques in the design in the real urban situation, formation of skills of social responsibility of the architect.

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– readiness for social mobility, adaptation to new situations, reassessment of experience, analysis of their capabilities, communication in the scientific, industrial and social spheres;
– the ability to interpret the results of applied research in the form of generalized design models.

Methodology in energy efficiency architecture

CODE – ARC208
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

THE PURPOSE AND OBJECTIVES OF THE COURSE
The purpose of the discipline is to give an idea of the place and role of energy-saving technologies in architecture and urban planning in accordance with the principles of sustainable development of human settlements. The objectives of the discipline "Methodology of energy efficiency in architecture" are:
– get an idea of the subject and the basic concepts of energy-efficient urban planning;
– to study the basic techniques and methods of improving the energy efficiency of urban facilities.

BRIEF DESCRIPTION OF THE COURSE
The discipline "Methodology of energy efficiency in architecture" is designed to improve the theoretical level of undergraduates in the field of architectural knowledge, to get acquainted with the basic methods of energy-efficient architecture and urban planning, necessary for decision-making in the practice of the architect.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE
As a result of the study of the discipline undergraduates should
know:
– basic concepts of energy-efficient urban planning;
– design principles of energy-efficient buildings and structures;
– regional features of energy-efficient urban development in Kazakhstan;
– the main provisions of the concept of "green economy" and "green urban planning»;
– design features of "passive" and "active" house, multi-comfortable home and "smart home»;
– laws of interaction of the city with the environment;
– methods of measurement and assessment of energy efficiency of buildings and structures;
know:
– to apply the methods of energy-efficient urban planning in practice;
– evaluate the energy efficiency of buildings and structures.

Energy efficiency in urban planning

CODE – ARC223
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

THE PURPOSE AND OBJECTIVES OF THE COURSE
The purpose of teaching the discipline. The discipline "energy Efficiency in urban planning" aims to:
– to acquaint students with the basic provisions of energy Efficiency in urban planning, with the nature of the research tasks facing the designer;
– to formulate the urban worldview of the student, aimed at understanding the social problems, the structure of settlement, spatial organization of the living environment;
– to identify the main trends in the development of the process of formation of cities;
– to help the student in solving complex urban problems, to achieve artistic expression of the city and its constituent elements;
– to highlight the social, technical,economic, architectural and planning aspects of modern urban planning.
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BRIEF DESCRIPTION OF THE COURSE
The discipline is designed to improve the theoretical level of undergraduates in the field of urban planning knowledge, to get acquainted with the basic methods of energy-efficient architecture and urban planning, necessary for decision-making in the practice of the architect.

KNOWLEDGE AND SKILLS UPON COMPLETION OF THE COURSE
As a result of studying the discipline, students should
know:
– the main provisions and tasks of urban analysis, solved in the modern theory and practice of urban planning;
– fundamentals of functional-spatial and compositional analysis of urban planning systems of different types of hierarchical level;
know:
– use knowledge in the practice of educational urban design;
– develop creative thinking skills;
– expressive graphic means to implement architectural and urban planning ideas.

Theory of elasticity and plasticity

CODE – CIV244
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

The purpose of the discipline "Theory of elasticity and plasticity" is the acquisition of undergraduates knowledge, skills, abilities to ensure the mechanical reliability of complex spatial structural elements in further practical work. Objectives of the discipline. The acquisition of skills in the calculation of complex structural elements, spatial structures, structures, machine parts for strength, stiffness and stability.

Dynamics of structures

CODE – CIV208
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

The purpose of development of discipline "Dynamics of structures" is:
- formation of students ' full and clear understanding of the principles of dynamic calculation of buildings and structures;

Objectives of the discipline:
- teach methods of calculation of buildings and structures for different types of dynamic loads;
- to generate knowledge about the kinds of dynamic effects, loads, structural measures to ensure the strength and stability of buildings and structures under dynamic effects;
- to develop skills of performing simple dynamic calculations, application of existing calculation systems to dynamic calculations of buildings and structures.

Seismic resistance of buildings and structures

CODE – CIV246
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

The purpose of the development of the discipline "seismic resistance of buildings and structures" is the acquisition of in-depth knowledge and skills necessary for the specialist in the design of buildings and structures in seismic areas of the earth, the development of the practice of calculations of buildings and structures for dynamic loads, including seismic, including using software systems.

Geotechnical engineering state and development prospects

CODE – CIV207
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

The purpose of the discipline:
An idea of perspective methods of calculation of Foundation bases taking into account nonlinear and rheological properties. Summary: Formation of soil mechanics and the role of domestic scientists. Theory of limit stress state of soils. Rheological processes in soils and their values. The dynamics of dispersed soils and methods of strengthening the bases and foundations. Features of works on the construction of foundations. Foundations in special construction conditions. Expected results: Optimization of the base of the annexed territories from the standpoint of Foundation. Automation of calculation of bases and foundations.

Modern methods and technologies of engineering systems

CODE – HYD266
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

The purpose of teaching is to form a complex of knowledge and skills on methods and technology of design, construction and operation of engineering systems and networks of buildings and structures and their application in practical work in the field of engineering. The discipline "Modern methods and technologies of engineering systems I" gives an idea of the General schemes, design and construction on the principle of sustainable development (LEED systems of heat and gas supply, heating, ventilation and air conditioning.

Special issues of heat supply in construction

CODE – HYD267
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

Special issues of heat supply in construction. The structure of the heat supply system of cities and towns. Characteristics of heat consumers and heat supply sources. Design capacity of the heat source for maintenance of construction needs. Stationary and mobile sources of heat. The necessary thermal power for drying of the building. Devices and equipment for drying buildings under construction.

Rational use of heat and gas in construction

CODE – HYD268
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

Study of the rational use of heat and natural gas in construction. Physical and chemical properties of combustible gases, structure and main directions of gas use, rational use of natural gas and combustible air with the use of modern fuel distribution system.

Start-up and adjustment of water supply and sewerage facilities

CODE – HYD216
CREDIT – 6 (2/0/1/3)
PREREQUISITE – ECA102

The purpose of the course is to improve the efficiency of water supply and sanitation systems. The following tools in the water system: faucets, sediment charcoal, and the intensity of the filters and triggers. Discipline "start-up and commissioning of water supply and Sewerage" gives an idea of the theoretical foundations and basic provisions of the reconstruction, intensification and efficiency of water supply systems, as well as environmental protection.

Registration and defense of the master's thesis

CODE – ECA206
CREDIT – 12

The purpose of the master's thesis is:
demonstration of the level of scientific/research qualification of undergraduates, the ability to independently conduct scientific research, testing the ability to solve specific scientific and practical problems, knowledge of the most common methods and techniques for their solution.

BRIEF DESCRIPTION
Master's thesis – final qualifying scientific work, which is a synthesis of the results of independent research undergraduate one of the actual problems of a particular specialty of the relevant branch of science, which has internal unity and reflects the progress and results of the development of the chosen topic.
Master's thesis – the result of the research /experimental research work of the undergraduate, conducted during the entire period of study undergraduate.
Pre-design studies of the object of dissertation research; conducting field and research and design studies; attribution of the building as an object of material culture, the definition of its artistic, historical value, technical condition and degree of preservation; the choice of the optimal model of restoration of the object of material culture, the development of scientific and design documentation necessary for the restoration and adaptation of the monument for modern use. Demonstration of acquired knowledge and skills in development in the field of protection, restoration and reconstruction of architectural heritage.
The defense of the master's thesis is the final stage of the master's degree.
Master's thesis must meet the following requirements:
– the work should be carried out research or solve current problems in the field of architecture and urban planning;
– the work should be based on the identification of important scientific problems and their solution;
– decisions should be scientifically grounded and reliable, have internal unity;
– dissertation work should be written alone.

Content