

Master's Program *Resources Conservation and Environmental Safety in Civil Engineering*

CORE COURSES

B.1.C.3. Methods for Solving Scientific and Engineering Problems in Civil Engineering

Course Aim

Students will acquire skills of defining a research problem, they will know theoretical concepts and have practical skills of solving various research and scientific and engineering problems.

Course Description

The course is delivered in modules. Students are expected to possess knowledge of defining a research problem, collecting available information and using information technologies. They will be able to formulate research objectives, forecast the results of studies, develop research programs. Students will obtain skills of using information technologies, methods of modeling, different methods of solving problems, processing experimental and theoretical data, the logic of scientific knowledge development and choice of alternative options.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- demonstrate knowledge of the program courses related to fundamental and applied sciences;
- use advanced theoretical and practical knowledge;
- acquire new knowledge and skills independently using information technologies in practice, including new areas of science not directly associated with their profession;
- broaden their scientific world outlook;
- use profound knowledge of legal and ethical norms evaluating the results of their professional activity, developing and implementing socially significant projects;
- understand main problems of the subject area and solve them using quantitative and qualitative methods;
- define a problem, apply knowledge of contemporary research methods, analyze, synthesize and make critical information summary;
- conduct scientific experiments using modern research equipment and devices, evaluate the results of the studies;
- execute, present and report the results of the work done;

Credit hours

Learners are expected to earn 5 credits for doing 108 hours of work.

In-class training: 90 hours, including 36 hours of lectures and 54 hours of practical classes.

Independent work: 90 hours.

Progress Evaluation

Pass/fail exam, 1st semester.

Graded exam, 2nd semester.

B.1.C.4. Information Technologies in Civil Engineering

Course Aim

Students will possess necessary theoretical knowledge and practical skills of applying information technologies in civil engineering.

Course Description

The course is a part of basic professional courses delivered in English. Students are expected to improve skills and knowledge obtained in the previous study of *Information Technologies in Civil Engineering* (Bachelor's level). The course is delivered in modules. Graduates will get knowledge of different universal and special software systems for processing scientific and technical information, automated design systems in civil engineering, peculiarities of their application in the design and calculation of complex construction projects and scientific and technical objectives, skills of using information and communication technologies in civil engineering.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- acquire new knowledge and skills using information technologies even in those areas which are not directly associated with their professional activity;
- broaden their scientific world outlook;
- develop preliminary, technical and working projects of complex objects, and use automated design systems for that;
- find, process and analyze information from a variety of sources, use universal and special software systems for solving computational problems in the design of buildings and structures.

Graduates will know:

- methods of design and monitoring of buildings and constructions, their structural components including methods of design-basis analysis using universal and special software systems and automated design systems.

Credit Hours

Learners are expected to earn 3 credits for doing 108 hours of work.

In-class training: 54 hours, including 18 hours of lectures and 36 hours of practical classes.

Independent work: 54 hours.

Progress Evaluation

Pass/fail exam, 1st semester.

B.1.C.5. Structural Design and Analysis of Buildings

Course aim

Students will understand principles of designing buildings and structures taking into account modern achievements in the field of calculation and design requirements for buildings and structures, theorems and principles of mechanics.

Course Description

The course focuses on requirements for buildings and structures; models of buildings and foundations according to B. A. Garagash's classification; structural systems of buildings and constructions; impact on buildings and structures; exploitation conditions; constructions standardization and certification; design layout, calculations and analysis results; design requirements and layout; features of design and construction in urban development conditions; structural engineering technology; spatial analysis of buildings on non-homogeneous foundations; scientific support of civil engineering.

Learning Outcomes (competences)

On completion of the course students will be able to:

- perform, present and report results of the work done;
- carry out surveys to evaluate natural and technological objects conditions, determine initial data for the design and calculation analysis and monitoring of objects; do patent research, prepare design specifications;
- develop conceptual, technical and working projects of complex objects using CAD.

Graduates will know:

- methods of design and monitoring of buildings and constructions, their structural components, including methods of calculation analysis using universal and specialized software packages and automated design systems.

Credit Hours

Learners are expected to earn 4 credits doing 144 hours of work.

In-class training: 36 hours, including 18 hours of lectures and 18 hours of practical classes.

Progress Evaluation

Exam, 1st semester.

The course assessment includes writing reports and answering questions.

B.1.C.6. Efficiency of Innovations and Innovative Technologies in Civil Engineering

Course Aim

Students will learn modern methods of collecting, processing and analyzing economic data related to innovative technologies in civil engineering; a system of technical and economic indicators to compare design projects; principles of techno-economic analysis of projects and methods for the innovative potential estimation.

Course Description

The course focuses on innovative activity in civil engineering, its basic concepts and peculiarities. The course modules cover such areas as innovative technologies in prefabricated large-panel and monolithic frame house-building; various technologies for frame-panel buildings construction, prefabricated buildings made of lightweight steel thin-walled structures, prefabricated houses of the container type *flatpack*; energy-saving technologies for repair, renovation and restoration of buildings; technologies for information modeling *BIM* (Building Information Modeling) and *Royal Building System* (RBS); technologies for the construction of buildings using building blocks *Smart Brick*, *Hebel blocks*, panels *Demountable Insulated Panels* (DIPS); methods for installation of ballasted roofs, methods for joint-free facade finish; “green” standards in civil

engineering and principles of "green development"; methods for the innovative potential estimation (a method of expert analysis, a method of financial and economic analysis, an analytical method); investment project stages, investment project components analysis for the construction of real estate; calculation of the investment project payback related to buildings reconstruction; technical and economic indicators system to compare options and financial analysis of design projects.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- make a preliminary techno-economic analysis of projects;
- develop estimate documents;
- make an economic analysis of projects effectiveness.

Graduates will know:

- methods for the estimation of the innovative potential of the performed work and its future prospects;
- modern achievements in civil engineering and their use;
- project commercialization risk assessment.

Credit Hours

Learners are expected to earn 3 credits doing 108 hours of work.

In-class training: 54 hours, including 18 hours of lectures and 36 hours of practical classes.

Independent work: 54 hours.

Progress Evaluation

Pass/fail exam, 3rd semester.

ADDITIONAL COURSES

Compulsory Courses

B.1.A.CC.1. Resources Conservation and Environmental Safety in Structural Engineering

Course Aim

Students will possess knowledge and skills of doing practical work related to modern and advanced techniques of resource and energy saving in civil engineering and housing and utilities.

Course Description

The course focuses on aspects of energy efficiency and thermal protection of civil buildings, and

buildings with the efficient use of thermal energy, modern methods for thermo-technical calculations; cladding structures with thermal efficiency, innovative means of saving thermal energy, methods of improving thermal and air conditions in buildings. The course deals with technical solutions for air-radiant heating, leaving air heat recovery, exterior walls combined with ventilation devices, solar energy systems, heat pumps, wind turbines. The course describes features of designing energy efficient new and old residence buildings including architectural and space-planning decisions; problems of ventilation impact on thermal and air conditions of a building. Students will possess knowledge of methods for thermo-technical calculations in compliance with modern regulations including calculations of humidity conditions for external walls with a ventilated air gap.

Learning Outcomes (Competences)

On completion of the course students will be ready to:

- make sketch plans, project reports and working designs for energy efficient and biopositive construction projects in compliance with modern requirements for resources conservation and ecology.

Graduates will be able to:

- make space-planning decisions for construction projects with regard to resource-saving technologies and the best international experience in this sphere;
- choose construction materials that meet all modern standards including those which are complied with in the field of environment protection and resource saving.

Students will know:

- methods used in structural engineering including calculation methods taking into account resource-saving, biopositive and "green" technologies.

Credit Hours

Learners are expected to earn 9 credits doing 324 hours of work.

In-class training: 90 hours, including 36 hours of lectures, 54 hours of laboratory work and 72 hours of practical classes.

Progress Evaluation

Exam, 1st and 2nd semesters.

Coursework, 2nd semester.

B.1.A.CC.2 Technogenic Accidents in Civil Engineering

Course Aim

Students will study modern theories of material destruction, reasons of construction accidents including bridges, hydraulic engineering constructions; methods for technical inspection and monitoring; ways of accident prevention.

Course Description

The course focuses on basic concepts and definitions of accidents, the role of accident analysis in faultless construction, ways of accident prevention, theory of materials destruction, mechanics of destruction, the stress intensity factor; reasons and consequences of accidents, construction accidents: hydraulic engineering works, bridges, tower structures, elevators, etc.; base destruction, ways to increase the reliability of the system "base – foundation – superstructure"; types and the most common defects and damages of load bearing and cladding structures; structural failure of buildings built during the winter period, in the conditions of permafrost, in seismic areas, on landslide territories, on collapsible, swelling and saline soil.

The course describes mistakes made during engineering-geological and geohydrological survey work, engineering, construction, preservation, exploitation, reconstruction, the quality control of building materials, construction installation works; ways to prevent accidents and damages; fundamentals of reliability theory; assessment of residual operation life of buildings and structures; technical inspection and monitoring.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- identify causes of technogenic accidents in civil engineering.

Graduates will know:

- main reasons of technogenic accidents of structural complexes and systems, their origin;
- ways to carry out the inspection of buildings and constructions in case of technogenic accidents or accident hazard.

Credit Hours

Learners are expected to earn 3 credits doing 108 hours of work.

In-class training: 54 hours, including 18 hours of lectures, 18 hours of laboratory work and 18 hours of practical classes.

Independent work: 54 hours.

Progress Evaluation

Exam, 2nd semester.

B.1.A.CC.3. Research Methods and Forecasting of Main Performance Characteristics of

Building Materials

Course Aim

The course focuses on concepts and methods needed for the analysis of the technical condition, the quality level of materials and structures on their basis, causes of this condition and material properties.

Course Description

The course is aimed at the development of students' knowledge, skills of the systems approach to the assessment of construction projects quality level as well as characteristics of their composition and structure. Students will study scientific research methods such as methods for conducting experiments, statistical methods for experimental data processing; the relationship of material composition and structure with its properties; properties and application of natural stone and products, materials obtained by thermal processing of mineral raw materials; inorganic binders; building materials based on inorganic binders; construction materials made of organic raw materials, organic binders, concrete and concrete-based mortar; polymeric materials and products; special-purpose building materials.

Learning Outcomes (Competences)

On completion of the course students will be able to:

– develop environmentally friendly, energy-efficient, resource-saving materials, biopositive constructions and building systems.

Graduates will know:

- basic principles for making construction materials with predetermined properties including environmentally friendly and energy efficient materials;
- principles for forecasting main performance characteristics of building materials and structures and evaluating their safety;
- research methods of physical, mechanical and technological properties of construction materials.

Credit hours

Learners are expected to earn 5 credits doing 180 hours of work.

In-class training: 54 hours, including 18 hours of lectures, 36 hours of practical classes.

Independent work: 54 hours.

Progress Evaluation

Exam, 2nd semester.

Coursework, 2nd semester.

B.1.A.CC.4. Design and Production of Environmentally Friendly Building Materials

Course Aim

The course describes the use of fundamental sciences issues in the technological process of construction materials production that allows to intensify the process, increase the quality of materials and efficient use of resources. The course focuses on theoretical concepts and practical skills in resource and energy saving related to the production and application of building materials and products. Students will learn how to define and solve problems concerning basic engineering equipment design at plants which produce building materials and products with regard to the calculated energy saving parameters; methods for the techno-economic analysis of resource and energy saving in the production and application of building materials and products.

Course Description

Graduates will possess knowledge of chemical and mineral composition of natural raw materials needed for building materials production; physical and chemical basic principles used for obtaining binders; materials composition, structure and properties; the structure of real crystals; diffusion, crystallization and phase transformations; physical basic principles of materials strength and plasticity; physical and chemical mechanics of disperse systems; progressive ways to control materials properties with the help of energy flows; the production of building materials using recycled production waste. The course covers such areas as glass and ceramics; cement; concrete; waterproofing materials; wall materials; road materials; polymeric materials; thermal insulating materials; tower type structures (water towers, chimneys, cooling towers), their structural design, basic principles of their parameters calculation.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- develop environmentally friendly, energy-efficient, resource-saving materials, biopositive constructions and building systems.

Graduates will know:

- basic principles for the production of construction materials and structures and methods of its optimization with regard to resource saving and environmental safety;
- construction materials design with the use of recycled waste production.

Credit Hours

Learners are expected to earn 7 credits doing 252 hours of work.

In-class training: 54 hours, including 18 hours of lectures, 18 hours of practical classes, 18 hours of laboratory work and 36 hours for writing courseworks.

Progress Evaluation

Exam, 3rd semester.

Elective Courses

B.1.A.EC.1.1. Assessment Methodology of Environmental Safety of Construction Projects

Course Aim

The course focuses on modern standards, methods and software for the estimation of ecological safety of construction projects both in Russia and abroad.

Course Description

The course is aimed at developing students' knowledge of modern methods and software tools for multi-criteria evaluation of environmental safety of construction projects both in Russia and abroad in compliance with life cycle analysis methodology (LCA), Russian environmental legislation and design and international standards ISO 14040 – 14049 that correspond to scientific and technological research priorities for construction industry development. Students will obtain skills of choosing methods and interactive design for ensuring ecological safety of construction projects at the stage of techno-economic analysis; algorithm design, methods for the creation of databases related to LCA information technology and the evaluation of ecological safety of objects. Students will know the methodology for the estimation of ecological safety of objects which includes sustainable development concept, a system approach, a life cycle analysis, project management methodology, international norms and standards, evaluation procedures for the environmental impact assessment (EIA) - the so-called *Statement of intent* as well as principles of decision-making theory, construction system engineering, construction processes theory, construction ecology, system modeling theory, information systems theory, safe building system theory.

Learning Outcomes (Competences)

On completion of the course students will be able to:

– use resource-saving technologies of building production in practice including biopositive construction decisions and materials.

Graduates will know:

- ways to evaluate the environmental safety of building materials and constructions used;
- the most environmentally friendly and least resource-intensive technologies of construction projects;
- methods of evaluating designs with regard to their environmental safety, resource

requirements and biopositivity.

Credit Hours

Learners are expected to earn 3 credits doing 108 hours of work.

In-class training: 54 hours, including 54 hours of practical classes.

Independent work: 54 hours.

Progress Evaluation

Pass/fail exam, 3rd semester.

B.1.A.EC.1.2. Environmental Safety in Civil Engineering

Course Aim

The course focuses on environmental awareness and knowledge of basic principles of environmental safety in civil engineering, human impact on the environment and the necessity to protect the environment from pollution.

Course Description

The course is aimed at the development of students' knowledge of ways for selecting and preparing land plots for construction. Students will obtain skills of choosing methods, solutions to environmental problems in civil engineering; analyzing safety requirements for the arrangement and maintenance of industrial areas, building sites and workplaces; electrical safety and fire safety in civil engineering; protecting workers from hazards on the construction site, in the process of exploiting mobile and fixed machines, in the process of using mechanized equipment, hand machines and tools in civil engineering; dealing with insulation, welding, gas-flame, earthwork operations, installation, roofing, finishing and underground works.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- use resource-saving technologies of building production in practice including biopositive construction decisions and materials.

Graduates will know:

- ways to evaluate the environmental safety of building materials and constructions used;
 - the most environmentally friendly and least resource-intensive technologies of construction projects;
- methods of evaluating designs with regard to their environmental safety, resource requirements and biopositivity.

Credit Hours

Learners are expected to earn 6 credits doing 216 hours of work.

In-class training: 126 hours, including 36 hours of lectures, 36 hours of practical classes and 54 hours of testing.

Progress Evaluation

Exam, 1st semester.

B.1.A.EC.2.1. Global Experience of Complying with Environmental Standards in Civil Engineering

Course Aim

The course focuses on environmental standards in civil engineering, *Green construction* development at the international level and in the Russian Federation, resource-saving construction, a comparative analysis of economic indicators.

Course Description

The course describes green construction, the history of green construction in Europe and the USA, green standards as a requirement for sustainable civil engineering; national green construction standards; tips on ecological construction; *LEED* (USGBC) standard, *BREEAM* standard (United Kingdom), *DGNB* standard (Germany); the ecological certification centre *Green standards*; market analysis of green construction in Russia; examples of certified buildings in Russia, ecohomes, the active house, the passive house; the architecture of ecohomes; materials for civil engineering; the eco-house structural body, heat insulation; foundations, floor structure, walls, roofs, windows, engineering equipment; the sun protection, molding; calculations and tests; standard residential energy-efficient house.

Learning Outcomes (Competences)

On completion of the course students will be ready to:

– design buildings and structures in compliance with the standards of green construction, resources conservation and environmental safety.

Graduates will know:

- the best international practice of green construction; methods for certification of construction projects in compliance with modern international and Russian "green" standards;
- principles of designing buildings and structures using "active" and "passive" technologies of resource saving.

Credit Hours

Learners are expected to earn 6 credits doing 216 hours of work.

In-class training: 72 hours, including 36 hours of lectures and 36 hours of practical classes.

Independent work: 90 hours.

Progress Evaluation

Exam, 1st semester.

B.1.A.EC.2.2 Modern Global Tendencies in the Sphere of Environmental Safety in Civil Engineering

Course Aim

The course focuses on problems of energy saving and environmental safety which are basic for producing competitive products in the construction industry; the environmental assessment of materials and structures, the application of obtained knowledge for designing and reconstruction of objects according to *Green Construction* standards.

Course Description

The course is aimed at the development of students' knowledge of global trends related to environmental safety of construction; collection of up-to-date information. Students will obtain skills of green construction with regard to the best international practice, methods for certification of construction projects in compliance with modern international and Russian green standards, principles of designing buildings and structures using "active" and "passive" technologies of resource saving. Students will learn modern methods for the assessment of energy efficiency and sustainability of building structures, materials, household equipment, engineering equipment, construction materials.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- develop methods, plans and programs of scientific research and development, design tasks for performers, organize experiments and tests, analyze and summarize results;
- collect, analyze and systematize information on the subject of research; prepare scientific and technical reports, reviews of publications on the subject of research;
- develop physical and mathematical (computer) models of phenomena and objects related to their professional activity;
- improve and develop production technological processes at the plant or site, control technical discipline and maintenance of process equipment and machines;
- be in charge of the organization;
- balance, test and commission facilities, samples of new and upgraded products

- manufactured by the plant;
- analyze the technological process as a management object; do the marketing and develop business plans for productive activities;
 - adapt modern versions of quality management systems to the specific conditions of production in compliance with international standards;
 - organize a teamwork, take executive decisions, determine the order of operations;
 - develop programs of innovative activities, organize advanced professional training, certification and personnel training in the sphere of innovative activity;
 - conduct technical expertise of construction projects;
 - organize the supervision of production, installation, balancing, commissioning of facilities;
 - design technical tasks concerning technical conditions, standards of enterprises, instructions and guidance on the use of techniques, technologies and equipment;
 - develop instructions for the equipment operation and check technical conditions and the residual life of building facilities and equipment, prepare technical documentation for doing repair work;
 - design buildings and structures in compliance with standards of green construction, resources conservation and environmental safety.

Graduates will know:

- methods for recording and protection of intellectual property objects, application of research results and commercialization of rights for intellectual property objects;
- pedagogical techniques for participation in academic activities of educational organization departments specializing in various fields of study;
- methods of providing safety at work; preventing occupational traumatism, professional diseases, environmental violations;
- methods for monitoring and evaluation of technical conditions of buildings, structures, their parts and engineering equipment;

Credit Hours

Learners are expected to earn 3 credits doing 108 hours of work.

In-class training: 54 hours, including 54 hours of practical classes.

Independent work: 54 hours.

Progress Evaluation

Pass/fail exam, 3rd semester.

B.1.A.EC.3.1. Engineering and Ecological Surveys and Environmental Monitoring in Civil Engineering

Course Aim

The course focuses on theoretical concepts and development of practical skills of conducting environmental surveys and environmental monitoring in civil engineering.

Course Description

The course improves students' knowledge of engineering surveys for construction projects received as a result of doing the courses *Geology* and *Geodesy* (Bachelor's level). Students will learn methods for conducting engineering and environmental surveys and their arrangement; basic principles of environmental monitoring as well as practical methods for the determination of its quality parameters. The course provides case studies for dealing with human impact on the environment during construction and environmental monitoring in civil engineering.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- apply and develop the environmental monitoring system on construction sites and in the process of exploiting building complexes and facilities with regard to emergencies caused by natural disasters and technogenic accidents;
- organize engineering-ecological surveys for construction projects.

Graduates will know:

- methods for the ecological monitoring of the environment and construction projects as well as main types of human impact on the environment and natural processes and disasters to which they lead.

Credit Hours

Learners are expected to earn 6 credits doing 216 hours of work.

In-class training: 54 hours, including 18 hours of lectures, 18 hours of laboratory work and 18 hours of practical classes.

Independent work: 90 hours.

Progress Evaluation

Exam, 3rd semester.

B.1.A.EC.3.2. Methods for the Analysis of Construction Impact on the Environment

Course Aim

The course focuses on theoretical concepts and development of practical skills of conducting environmental surveys and environmental monitoring in civil engineering.

Course Description

The course improves students' knowledge of engineering surveys for construction projects received as a result of doing the courses *Geology* and *Ecology* (Bachelor's level). Students will learn methods for conducting engineering and environmental surveys and their arrangement; basic principles of environmental monitoring as well as practical methods for the determination of its quality parameters. The course provides case studies for dealing with human impact on the environment during construction and environmental monitoring in civil engineering.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- apply and develop the environmental monitoring system on construction sites and in the process of exploiting building complexes and facilities with regard to emergencies caused by natural disasters and technogenic accidents;
- organize engineering-ecological surveys for construction projects.

Graduates will know:

- methods for the ecological monitoring of the environment and construction projects as well as main types of human impact on the environment and natural processes and disasters to which they lead.

Credit Hours

Learners are expected to earn 6 credits doing 216 hours of work.

In-class training: 54 hours, including 18 hours of lectures, 18 hours of laboratory work and 18 hours of practical classes.

Independent work: 90 hours.

Progress Evaluation

Exam, 3rd semester.

B.2 Practical Experience Including Research Work

B.2.I.1. Industrial Placement

Course Aim

The course focuses on research methods of stress deformation in bearing building structures of constructions, technical inspection and analysis of the results by making conclusions about the technical state of bearing building structures of constructions.

Course Description

The course gives requirements for buildings and structures; it describes models of buildings and foundations according to B. A. Garagash's classification; structural systems of buildings and constructions; impact on buildings and structures; exploitation conditions; constructions standardization and certification; design layout, calculations and analysis results; design requirements and layout; features of design and construction in urban development conditions; structural engineering technology; spatial analysis of buildings on non-homogeneous foundations; scientific support of civil engineering.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- apply and develop the environmental monitoring system on construction sites and in the process of exploiting building complexes and facilities with regard to emergencies caused by natural disasters and technogenic accidents;
- identify the most hazardous areas of building structures, buildings and constructions and modes of loading to control their stress-strain state.

Graduates will know:

- modern methods for the instrumentation control and tools for it; methods for the engineering survey of equipment, monitoring and diagnostics of construction components and projects.

Credit Hours

Learners are expected to earn 8 credits doing 288 hours of work.

In-class training: 18 hours, including 18 hours of lectures.

Independent work: 270 hours.

Progress Evaluation

Graded exam, 2nd semester.

B.2.I.2. Computer-Aided Construction Internship

Course Aim

The course focuses on theoretical concepts and development of practical skills of using modern computer technologies for solving professionally-oriented practical tasks.

Course Description

The course improves knowledge and skills received by students as a result of doing the courses *Design Software for Structural Design Calculation* and *Information Technologies in Civil Engineering*. The course develops students' abilities and practical skills of using modern software

for solving practical tasks of civil engineering. Students will learn to use information and computer technologies for solving problems related to their future professional activity.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- develop environmentally friendly, energy-efficient, resource-saving materials, biopositive construction and building systems;
- use modern finite element software systems for the calculation of building structures with the help of computer technologies.

Credit Hours

Learners are expected to earn 8 credits doing 288 hours of work.

In-class training: 18 hours, including 18 hours of practical classes.

Independent work: 270 hours.

Progress Evaluation

Pass/fail exam, 3rd semester.

B.2.R. Research Work

B.2.R.1. Experimental Research Work

Course Aim

The course is designed to develop knowledge of research methods, the ability to analyze and process research results, solve problem situations, prepare, conduct and analyze results of the research work in the field of resource saving and ecology in civil engineering; the ability to review literature, do patent research, describe the results of research and issue articles as well as determine the main physical and mechanical properties of building materials and building structures.

Course Description

The course focuses on modern methodology of scientific research and the ability to apply it working on the chosen subject; the analysis of all stages of the scientific work; studying modern methods of information collection and analysis; the representation of the results in reports, articles and guidance papers. In the process of doing research students will learn about the activities of research centres and scientific teams working in this sphere. Students will possess knowledge and skills in the research area which represent an in-depth study of scientific research methods and correspond to the chosen subject. Graduates will get skills of using modern research equipment and instruments, developing methods, plans and programs of scientific research and development. They will be able to design tasks, organize experiments and tests, analyze and summarize their results.

Research centres are departments, laboratories, research institutes and other organizations with

the necessary equipment.

Learning Outcomes (Competences)

On completion of the course students will be able to:

– develop environmentally friendly, energy-efficient, resource-saving materials, biopositive construction and building systems.

Graduates will know:

- basic methods for the research of physical, mechanical and technological properties of building materials.

Credit Hours

Learners are expected to earn 8 credits doing 288 hours of work.

Independent work: 288 hours.

Progress Evaluation

Graded exam, 1st semester.

B. 2.W.1. Work Experience Internship

Course Aim

The course is aimed at the development of practical skills in ecological monitoring of the environment and ecological survey.

Course Description

The course improves knowledge and skills received by students as a result of doing the courses *Geology, Geodesy* (Bachelor's level) and *Engineering and Environmental Surveys and Environmental Monitoring in Civil Engineering* (Master's level). Students will study methods for conducting engineering and environmental surveys in civil engineering and their arrangement. Graduates will learn how to use laboratory and research equipment and apply the knowledge for solving practical problems.

Learning Outcomes (Competences)

On completion of the course students will be able to:

– develop the environmental monitoring system in the areas of construction and exploitation of building complexes and facilities with regard to emergencies caused by natural disasters and technogenic accidents.

Credit Hours

Learners are expected to earn 6 credits doing 216 hours of work.

Independent work: 216 hours.

Progress Evaluation

Graded exam, 3rd semester.

B2.R.2 Research Internship

Course Aim

The course focuses on resource-saving technologies in building production including biopositive construction decisions and materials, and conceptual, technical and working projects of energy-efficient and biopositive construction projects in compliance with modern requirements for energy saving and ecology.

Course Description

The course is aimed at the development of practical skills of using resource-saving technologies in building production including biopositive construction decisions and materials, and conceptual, technical and working projects of energy-efficient and biopositive construction projects in compliance with modern requirements for energy saving and ecology.

Learning Outcomes (Competences)

On completion of the course students will be able to:

- develop conceptual, technical and working projects for energy-efficient and biopositive construction projects in compliance with modern requirements for energy saving and ecology;
- use resource saving technologies in building production with regard to biopositive construction decisions and materials.

Credit Hours

Learners are expected to earn 24 credits doing 864 hours of work.

Independent work: 864 hours.

Progress Evaluation

Graded exam, 4th semester.

Russian as a Foreign Language (3 credits)

Course Aim

The aim of the course is to develop students' proficiency in the Russian language, sufficient to meet basic communication needs in domestic, social and cultural settings when communicating with native speakers in a basic range of situations.

Course Description

The course is for foreign students who have not previously studied the Russian language.

In the process of learning Russian as a foreign language, students will learn basic vocabulary, a set of lexical and grammatical structures sufficient for reading and understanding of simple texts for study and socio-cultural purposes of up to 150 words (e.g., road maps and city signs, names of squares, streets, etc.; retail signs, billboards, ads tours and other cultural events), learn to understand basic conversations (up to 60 words), monologue (up to 120 words). Learners will be able to start conversation and adequately respond to interlocutor's statements (expressing wishes, requests, agreement /disagreement, gratitude, etc., personal attitude to events, facts), to produce coherent utterances on the proposed topic (minimum 7 phrases). International students will learn to cover their communication needs on the following topics: "About myself", "Work", "Study", "Working Day", "Leisure", "Holidays", "Family", and maintain simple conversations on familiar topics, including "Food", "Health", "Weather", "Transportation", "Shopping", "Getting around the city".

Learning Outcomes (Competences)

By the end of the course learners will be able to:

- understand spoken utterances about basic survival needs in areas of immediate need or on very familiar topics, understand simple questions and answers, simple statements and simple face-to-face conversations, understand the topic of the conversation, main and additional information (students will listen to the recording twice);
- read texts for gist; understand and define the theme of the text and its main idea; understand main and additional information of the text;
- create sentences and short paragraphs, produce simple written texts related to most survival needs and limited social demands;
- produce coherent utterances on the proposed topic and cultural setting; respond adequately to interlocutor' statements; start and end conversation in an appropriate manner, express communicative intent within the studied themes and communication situations.

Learning Hours

Learners are expected to earn 3 credits for doing 216 hours of work.

The course is delivered in the 1st semester of the 1st year of study.

Classroom instruction: 108 hours, including 108 hours of practical classes;

Independent work: 108 hours.

Progress Evaluation

Pass/fail exam, 1st semester.