



Attachments

CONSTRUCTION AND CIVIL ENGINEERING

Curriculum - Academic Year 2025-26

Year/ Semester	Course Unit	ECTS credits	Lecturer(s)	Qualification
I/1°; I/2°	Academic English	4	Lecturer 1	Professor
I/2°	Civil protection and occupational safety in the industry	3	Lecturer 2	Professor
I/2°	Information technologies in construction project management	3	Yuliia SHABARDINA	Associate Prof.
I/1°	Prototyping of buildings and structures	5	Timur HANIEIEV	Associate Prof.
I/1°	Digitalization on Economics in Construction Sector	3	Svitlana YUSHCHENKO	Associate Prof.
I/1°	Modern information technologies of designing engineering systems	4	Timur HANIEIEV	Associate Prof.
I/2°	BIM-Design of Buildings and Structures	7	Olena SAVCHENKO	Professor
I/2°	Ecological construction	4	Lecturer 3	Professor
I/2°	Thermal modernisation of housing stock	4	Serhii OLEKSIENKO	Associate Prof.
I/2°	Fire safety of buildings and structures		Lecturer 4	Associate Prof.
I/2°	Creative thinking	3	Lecturer 5	Associate Prof.
I/2°	Time management		Lecturer 6	Associate Prof.
I/2°	Communication technologies		Lecturer 7	Associate Prof.
I/2°	Training Course: Fundamentals of Startups		Yuliia SHABARDINA	Associate Prof.
	Major "BIM- technologies in architecture and construction"			
I/1°	<i>Technologies for modeling building structures</i>	6	Mykhailo RUDENKO	Senior lecturer
I/1°	<i>Inspection of Buildings and Structures</i>	5	Maksym BOLOTOV	Associate Prof.
I/2°	<i>BLM technologies</i>	4	Mykhailo RUDENKO	Senior lecturer
I/2°	<i>Innovative engineering and construction technologies</i>	5	Timur HANIEIEV	Associate Prof.
	Major "Observation and reconstruction of buildings and structures"			
I/1°	<i>Reconstruction and modernization of building systems</i>	6	Mykola KORZACHENKO	Associate Prof.
I/1°	<i>Technology of special buildings and structures construction</i>	5	Maksym BOLOTOV	Associate Prof.
I/1°	<i>Building structures of buildings and constructions from the 17th to the 20th centuries</i>	4	Mykola KORZACHENKO	Associate Prof.
I/2°	<i>Energy saving and energy audit in construction</i>	5	Maksym BOLOTOV	Associate Prof.
II/1°	Pre-diploma practice	12		
II/1°	Qualification work	18		
	Total ECTS credits	90		



Name	Academic English
ECTS credits	4
Year / Semester	I/I°; I/II°
Specific learning outcomes	Communicate fluently in national and foreign languages orally and in writing to discuss professional problems and results of activities in the field of architecture and construction.
Contents	Meet academic English. Structuring a presentation. Study an academic context. Basic presentation tips. Planning the main paragraphs of an essay. Presentation media and tools. Drafting and building arguments. Types of visuals.
Teaching and learning methods	32 hours in contact
Teaching techniques	Practical classes in contact 32 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The differentiated credit will conduct in form of control test. The tasks for it are compiled on the basis of the training materials all of content modules of the semester and make it possible to check the level of knowledge of student in various types of speech activity.
Assessment metrics	Semester control and differentiated credit
Criteria of attribution of the final grade	Rating evaluation by 100-point system: current training – 80 points, differentiated credit – 20 points. During practical training the current control is carried out in oral/written survey. This type of control is evaluated by 40 points for content module, from which the student receives up to 10 points for attending classes, activeness, up to 10 points – for preparation to classes, up to 20 points – for performing the tasks.
Prerequisites	Foreign language for professional orientation, that was studied at the previous degree of education.
Educational material of reference	Grussendorf M. English for Presentations. Oxford University Press, 2007. 80 p. Hewings M. Cambridge Academic English Upper-Intermediate. Student's Book. Cambridge University Press, 2012. 176 p.



Name	Civil protection and occupational safety in the industry
ECTS credits	3
Year / Semester	I/II°
Specific learning outcomes	Develop and manage of labour and environmental protection measures while research and production activities, the ability to ensure the health and working capacity of employees. Solve the problems of construction and civil engineering in new or unfamiliar environments in the presence of incomplete or limited information, taking into account the aspects of social and ethical responsibility, to solve professional tasks taking into account the requirements of labor protection.
Contents	International standards in the field of occupational safety. The main legislative and regulatory acts on occupational safety in the construction industry. Occupational safety management systems in enterprises. Injury and occupational diseases. Special sections of occupational safety in professional activities. Current occupational safety issues in scientific research. Basic fire prevention measures at industry facilities. State supervision and public control over the state of occupational safety in industry enterprises. Social insurance against accidents and occupational diseases in the workplace. Monitoring hazards that could cause emergencies. Planning civil protection measures at enterprises in the automation and instrumentation industry. Methods for calculating impact zones from man-made explosions and fires, and explosion and fire protection of economic objects. Forecasting the situation and planning protective measures in areas of radioactive, chemical, and biological contamination. Assessment of engineering conditions and the socio-economic consequences of emergencies. Ensuring measures and actions within the unified civil protection system. The special function of enterprises in the field of civil protection.
Teaching and learning methods	24 hours in contact and online
Teaching techniques	Online Lectures 12 hours Practical classes in contact 12 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The differentiated credit will conducted in the form of tests on the university's Moodle distance education platform. During the test, students must have knowledge of ensuring effective occupational safety management and improving working conditions, taking into account the achievements of scientific and technical progress and international experience, as well as safety requirements in the industry.
Assessment metrics	Semester control and differentiated credit
Criteria of attribution of the final grade	Rating assessment on a 100-point scale: current control – 60 points. 40 points for attendance, completion of independent study tasks, work during practical classes; module control (tests in the Moodle system) 20 points; final control – 20 points (exam).
Prerequisites	Required mandatory preliminary modules (academic disciplines): "Life Safety and Basics of Occupational Safety" at the bachelor's level.
Educational material of reference	Civil defense and labor protection in the industry. Methodical instructions for practical work / Incl.: Denisova N.M., Buyalska N.P. – Chernihiv: ChNTU, 2020. – 113 p. (Ukrainian).



Name	Information technologies in construction project management
ECTS credits	3
Year / Semester	I/II°
Specific learning outcomes	Apply specialized conceptual knowledge, including modern scientific achievements including up-to-date BIM-technologies, as well as critical understanding of current problems in the field of construction and civil engineering to solve the complex problems of professional activity. Track down the latest achievements in chosen specialization, and their application for innovations creation. Select the cutting-edge materials, technologies and methods of construction, considering the architectural and planning, constructive part of the project and the base of the construction organization.
Contents	Integration of Information Technologies into Construction Processes. Digital Twins in Construction. Implementation of Blockchain in Construction Projects. The Role of Artificial Intelligence (AI) in Construction Projects. The Internet of Things (IoT) and Its Impact on Construction. Environmental Sustainability and Green Building with IT. The Role of Big Data in Construction Projects. Legal Aspects and Regulation of IT Use in Construction.
Teaching and learning methods	24 hours in contact and online
Teaching techniques	Online Lectures 16 hours Practical classes in contact 8 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The differentiated credit will be conducted in the form of tests on the university's Moodle distance education platform. During the test, students should understand the impact of IT on various stages of the construction cycle; the main IT trends in construction; the principles of working with Building Information Modeling (BIM); the advantages, limitations, and challenges of implementing blockchain technology in construction projects; the main applications of artificial intelligence in construction; the functions of Digital Twins in managing construction projects; the concept of the Internet of Things (IoT) and its role in construction processes; the role of information technology in ensuring the environmental sustainability of buildings and reducing energy consumption; the challenges related to the integration of Big Data into construction processes; the main regulatory acts and standards regarding the use of IT in construction.
Assessment metrics	Semester control and differentiated credit
Criteria of attribution of the final grade	During the semester the students can achieve a maximum grade of 100 points, which is made up of 40 points after successfully passing practical work; 20 points for semester tests, and 40 points for an differentiated credit.
Prerequisites	Knowledge of the basics of construction engineering, information technology, understanding of project management, construction law and regulatory documents, as well as the fundamentals of mathematics and analytics are required. Students should have computer skills and logical thinking abilities, along with the capability for an analytical approach to problem-solving.
Educational material of reference	Trefor Williams Information Technology for Construction Managers, Architects and Engineers / Thomson Delmar Learning, 2007. 238 p. K.E. Pearlson, C.S. Saunders, D.F. Galletta Managing and using information systems: A strategic approach, 2024. 251 p.



Name	Prototyping of buildings and structures
ECTS credits	5
Year / Semester	I/1°
Specific learning outcomes	The purpose of the course "Prototyping of buildings and structures" is to provide the student of higher education with the necessary knowledge, practical skills and competences in innovative technologies for the production of master models, large-scale models and prototypes of buildings and structures, including architectural structures. The study of the discipline involves consideration of existing prototyping technologies, analysis of the scope of application of each of the technologies, mastering practical skills of working with modern equipment for 3d printing and scanning, individual work on an electronic model of the object.
Contents	Terminology and classification. Characteristics of the AM-technologies market. Technologies and machines for growing metal products. Additive technologies and foundry production. Technologies and machines for the synthesis of sand casting forms. Technology and equipment for three-dimensional scanning of buildings and structures. Modeling of historical monuments. Technology of manufacturing prototypes of historical buildings.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 26 hours Laboratory classes in contact 14 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". During the test, students should know the basic technologies of non-contact scanning and additive manufacturing applied to historical buildings.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the final grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 35 points after a success passing of practical work; 25 points of semester test and 40 points of an exam grade.
Prerequisites	Required knowledge of basic mathematical calculations, spatial and abstract thinking.
Educational material of reference	Joanna A. Pawlowicz. 3D MODELLING OF HISTORIC BUILDINGS USING DATA FROM A LASER SCANNER MEASUREMENTS. Journal of International Scientific Publications: Materials, Methods & Technologies 8, 340-345 (2014). https://www.scientific-publications.net/en/article/1000181/ . Vacca, Giuseppina & Deidda, Monica & Dessi, A. & Marras, M.. (2012). LASER SCANNER SURVEY TO CULTURAL HERITAGE CONSERVATION AND RESTORATION. ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. XXXIX-B5. 589-594. 10.5194/isprsarchives-XXXIX-B5-589-2012.



Name	Digitalization on Economics in Construction Sector
ECTS credits	3
Year / Semester	I/1°
Specific learning outcomes	The successful completion of this course provides such learning outcomes according to the degree program: <ul style="list-style-type: none"> - Conduct technical examination of projects in construction and civil engineering, monitoring compliance of projects and technical documentation, design tasks, technical conditions, energy efficiency requirements and other applicable regulatory and legal documents in the field of architecture and construction. - Select the cutting-edge materials, technologies and methods of construction, considering the architectural and planning, constructive part of the project and the base of the construction organization.
Contents	Economics in construction. General provisions for determining the cost of construction. Estimate normative base. Stages of determining the cost of construction. The procedure of preparation of estimate documentation on different design stages. Automated creation of estimate documents using BIM.
Teaching and learning methods	24 hours in contact and online
Teaching techniques	Online Lectures 14 hours Laboratory works in contact / on-line 10 hours
Methods of monitoring	Oral and written control in form of "question-answer" and control in form of on-line tests / practical tasks. Control of the correctness and design of individual works
Assessment criteria	The differentiated credit will conduct in form of final test on the Chernihiv Polytechnic National University's platform of remote education "Moodle". The test controls knowledge of students about the essence of economics of construction, the estimate normative base, kinds of estimate documents, main rules of determining the cost of construction on different design stages
Assessment metrics	Semester control and differentiated credit grade
Criteria of attribution of the final grade	During semester the students can achieve a maximum grade of 70 points, which is made up of: <ul style="list-style-type: none"> - 35 points after a success passing of laboratory works; - 20 points of current semester tests; - 15 points of individual work; Maximum point of differentiated credit grade - 30 points. Maximum final grade – 100 points.
Prerequisites	Required knowledge of basic mathematical calculations, spatial mindset, critical thinking, students should be able to use theoretical and practical skills in math, drawing, and also basic knowledge of technology and organization of construction production
Educational material of reference	<ul style="list-style-type: none"> - Estimate normative of Ukraine "The guideline of determining the cost of construction" [in Ukrainian] - Thematic catalog "Pricing in construction" [in Ukrainian] - Peterson Steven J., Dagostino Frank R. Estimating in Building Construction. 8th edition. Pearson Education, Inc., 2014. 368 p.



Name	Modern information technologies of designing engineering systems
ECTS credits	4
Year / Semester	I / 1 °
Specific learning outcomes	The purpose of the course is to familiarize applicants of higher education with modern requirements for building and designing systems life support of construction objects, in particular to provide knowledge of advanced technologies laying, designing and ensuring the viability of water supply systems and drainage. The discipline systematizes and supplements already acquired knowledge with modern environmental knowledge trends and technologies, providing an opportunity for students of higher education to implement in the production of the latest global developments, taking into account regulatory and legal acts in the field construction and life safety.
Contents	General principles of ensuring reliability and structural safety buildings and structures. Classification of construction objects. Ensuring survivability. Methods of calculating reliability. The method of calculated limit states (partial coefficients reliability). Principles of verification. Combination loads and influences. Probabilistic calculation of reliability. Control parameters. Control process and its planning. Probabilistic calculation reliability. External drainage systems. Routing of external drainage networks. Features of equipment and structures sewage networks. The procedure for designing the drainage system of the settlement.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 18 hours Practical classes in contact 14 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". During testing, students must know the basics of hydraulic calculations, requirements for the placement and operation of engineering networks.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the final grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 35 points after a success passing of practical work; 25 points of semester test and 40 points of an exam grade.
Prerequisites	Basic knowledge of construction drawing, the basics of hydraulic calculation of pipelines is required.
Educational material of reference	Portnov, M & Popov, A & Hrudka, Jaroslav & Stanko, Stefan. (2021). Designing the sewerage network of the city in purpose to reduce impact to the environment and water bodies. IOP Conference Series: Materials Science and Engineering. 1209. 012076. 10.1088/1757-899X/1209/1/012076. Fakouri, Bahman & Samani, Jamal & Mohammad Vali Samani, Hossein & Mazaheri, Mehdi. (2021). Optimal Waste Load Model in Karoon River with the Pollution Loading Loss Analysis. 17. 330-344.



Name	BIM-Design of Buildings and Structures
ECTS credits	7
Year / Semester	I/II°
Specific learning outcomes	<p>The successful completion of this course provides such learning outcomes according to the degree program:</p> <ul style="list-style-type: none"> - Design buildings and structures (according to specialization), including of CAD systems application (BIM-technologies), to ensure of their reliability and durability, making rational design and technical decisions, technical and economic substantiation, considering the peculiarities of the constructional object, determination of the optimal mode of its functioning and implementation of resource and energy saving measures. - Apply specialized conceptual knowledge, including modern scientific achievements including up-to-date BIM-technologies, as well as critical understanding of current problems in the field of construction and civil engineering to solve the complex problems of professional activity. - Apply an up-to-date mathematical methods for statistical data analysis, calculation and optimization of design parameters and technological processes of construction of buildings and structures, use of modern methods and means of three-dimensional scanning, modeling (BIM-technologies) and additive technologies. - Apply building information modelling using the principles of energy efficiency, reliability and sustainable development to manage the life cycle of historical, modern buildings and structures and objects damaged as a result of military operations.
Contents	<p>BIM in the world and in Ukraine. General characteristics of BIM. Examples of using BIM in world practice.</p> <p>Basic principles of building and using an information model (BIM) throughout the life cycle of a building or structure. Software for creating an information model of buildings and structures. Using the possibilities of information modeling in the reconstruction and new design of buildings</p> <p>Basics of designing public buildings: general information about structures and structural elements; design stages and tasks; typology of buildings and structures.</p> <p>Current trends in the development of architectural, planning and design solutions for industrial, public and residential buildings and complexes. Physical and technical foundations of architectural design. Fundamentals of the methodology for the design, construction, reconstruction and operation of civil and industrial buildings and structures, taking into account the urban planning aspects of the design of buildings and structures, the principles of universal design, energy efficiency and ensuring the protection of the public.</p>
Teaching and learning methods	<p>56 hours in contact and online.</p> <p>Consulting and help the design and defense of individual course project</p>
Teaching techniques	<p>Online Lectures 28 hours</p> <p>Practical classes in contact 14 hours and laboratory classes in contact 14 hours</p>
Methods of monitoring	<p>Oral and written control in form of "question-answer" and control in form of online tests / practical tasks. Control of the design and correctness of individual works</p>
Assessment criteria	<p>The exam will conduct in form of test on the CPNU's platform of remote education "Moodle".</p> <p>When taking the test students should be knowledgeable about the methods and technologies of BIM-design of residential, public and industrial buildings and structures as industrialized building systems, taking into account technological, technical, architectural, artistic and economic requirements.</p>
Assessment metrics	<p>Semester control and Exam grade, grade of the design and defense of individual course project</p>



<p>Criteria of attribution of the final grade</p>	<p>During semester the students can achieve a maximum grade of 60 points, which is made up of:</p> <ul style="list-style-type: none"> - 20 points after a success passing of laboratory works; - 20 points of current semester tests; - 20 points of individual work; <p>Maximum point of exam grade - 40 points. Maximum final grade – 100 point</p> <p>For the course project, students can receive a maximum of 100 points, which consist of:</p> <ul style="list-style-type: none"> 40 points for answers to questions on defense, 40 points for the accuracy and quality of drawings and explanatory notes 20 points for the use of innovative technologies while working on the project
<p>Prerequisites</p>	<p>Required knowledge of Architecture of buildings and structures, City planning and transport, Construction Physics, Engineering graphics, Engineering geodesy, Building materials science, Building structures, and also basic mathematical calculations, spatial mindset, logic, critical thinking, students should be able to use theoretical and practical skills in BIM-programs, computer graphics, drawing, and also knowledge of technology and organization of construction production</p>
<p>Educational material of reference</p>	<ol style="list-style-type: none"> 1. Kulikov P.M., Ploskiy V.O., Getun G.V. Structures of buildings and structures. Book 1: textbook/Edited by Getun G.V. - Kyiv: "Lira-K Publishing House," 2021. - 880 p. (In Ukrainian) 2. Angus J. Macdonald. Structure and Architecture. Department of Architecture, University of Edinburgh. Second edition. ISBN 0 7506 4793 0. Available at: http://www.arch.mcgill.ca/prof/sijpkcs/arch-struct-2008/book-1.pdf 3. Andrea Deplazes (Ed.) Birkhäuser Architecture Materials Processes Structures: A Handbook. Birkhäuser – Publishers for Architecture. Basel · Boston · Berlin. 479 p. 4. What is BIM in construction management? BIM in construction industry, available at: https://revizto.com/en/bim-in-construction-management/ (accessed September 2024)



Name	Ecological construction
ECTS credits	4
Year / Semester	1/2°
Specific learning outcomes	The successful completion of this course provides such learning outcomes according to the degree program: <ul style="list-style-type: none"> - Track down the latest achievements in chosen specialization, and their application for innovations creation. - Select the cutting-edge materials, technologies and methods of construction, considering the architectural and planning, constructive part of the project and the base of the construction organization. - Gather the necessary information using scientific and technical literature, databases and other sources, analyze and evaluate it.
Contents	Regulatory control of environmental aspects of construction and architecture. The main directions of ecological construction. Use of ecological materials in construction. Reuse of materials and use of recycled materials. Energy-saving materials and energy-saving technologies in construction. Ecological environment protection. BIM technology in greenbuilding.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 18 hours Practical classes in contact 14 hours
Methods of monitoring	Oral and written control in form of "question-answer" and control in form of on-line tests / practical tasks. Control of the design and correctness of individual works
Assessment criteria	The exam will conduct in form of test on the Chernihiv Polytechnic National University's platform of remote education "Moodle". When taking the test, students should be knowledgeable about ecological materials, material reuse, recycled materials, energy-saving materials, energy-saving technologies.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the final grade	During semester the students can achieve a maximum grade of 60 points, which is made up of: <ul style="list-style-type: none"> - 20 points after a success passing of laboratory works; - 20 points of current semester tests; - 20 points of individual work; Maximum point of exam grade - 40 points. Maximum final grade – 100 points.
Prerequisites	Required knowledge of basic mathematical calculations, spatial mindset, logic, critical thinking, students should be able to use theoretical and practical skills in math, drawing, and also basic knowledge of technology and organization of construction production
Educational material of reference	- Tsyhychko S. Ecology in architecture and urban planning: textbook. Kharkiv, 2012. 146 p. [in Ukrainian] - Green Building with Concrete. Sustainable Design and Construction / Edited by Gajanan M. Sabnis. New York: CRC Press, 2012. 300 p.



Name	Thermal modernisation of housing stock
ECTS credits	4
Year / Semester	1/2°
Specific learning outcomes	Apply specialized conceptual knowledge, including modern scientific achievements including up-to-date BIM-technologies, as well as critical understanding of current problems in the field of construction and civil engineering to solve the complex problems of professional activity. Apply building information modelling using the principles of energy efficiency, reliability and sustainable development to manage the life cycle of historical, modern buildings and structures and objects damaged as a result of military operations.
Contents	The current state and challenges of residential buildings in Ukraine. The current regulatory framework for the thermal modernisation of housing stock buildings. Residential energy audit. Technical activities for thermal modernisation of the housing stock. Modern materials and technologies for thermal modernisation of buildings. Calculation methods for the thermal resistance of fencing structures. Calculation methods for building heat losses. Calculation of heat input and thermal capacity of the building. Calculation methods for the insulation of building exterior walls.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 18 hours Laboratory works in contact 14 hours
Methods of monitoring	Oral and written control in the form of the control work. Control of the accuracy of individual tasks.
Assessment criteria	The exam will conduct in form of test on the Chernihiv Polytechnic National University's platform of remote education "Moodle". The test is focused on identifying students' knowledge of energy audit of residential buildings and the use of technical activities, technologies, modern materials for thermal modernisation of buildings, as well as on their ability to provide technical and economic analysis of the conditions for the implementation of energy saving activities.
Assessment metrics	Semester control and exam grade
Criteria of attribution of the final grade	The final grade is calculated as the sum of the grades of the content module and the examination grade. The grade of the content module consists of: - student attendance at lectures - maximum 18 points; - the accuracy of individual tasks - maximum 28 points; - control work - maximum 14 points. Student attendance at lectures - 2 points per lecture, if the student was not present - 0 points. The accuracy of individual tasks - 2 points per laboratory work. The maximum exam grade is 40 points.
Prerequisites	The students should possess the elementary knowledge of math calculation, spatial and abstract mindset, be able to use the theoretical and practical skills in math and physics.
Educational material of reference	State Building Code DBN B.1.2-11:2021 Energy saving and energy efficiency State Building Code DBN B.2.6-31:2021 Thermal insulation and energy efficiency of buildings State Standard of Ukraine DSTU 9191:2022 Thermal insulation of buildings method for choosing of insulation material for insulation of buildings Innovative Construction Technologies & Thermal Comfort in Affordable Housing: Handbook / Prof. Rajan Rawal, Bhavya Pathak, Prof. Yash Shukla [et al]. - India: Government of India and Ministry of Housing & Urban Affairs: October 2022. – 248 pp.



Name	Fire safety of buildings and structures
ECTS credits	4
Year / Semester	1/2°
Specific learning outcomes	Develop and manage of labour and environmental protection measures while research and production activities, the ability to ensure the health and working capacity of employees.
Contents	General requirements for ensuring the safety of buildings and structures. Fire safety requirements for the spatial planning solutions of buildings and structures. Fire-technical inspections of various types of objects. Fire safety requirements for the installation of heat-accumulating stoves and chimneys. Fire safety requirements for ventilation systems. Fire-technical inspection of ventilation and air conditioning systems. Fire barriers. Fire safety requirements for evacuation routes and exits. Inspection of evacuation routes. Explosion protection of buildings and structures. Calculation of the area of easily removable structures. Smoke protection of high-rise buildings. Fire-technical inspection of high-rise buildings
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 18 hours Lab work 14 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	Exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". During the exam, the students will be required to essence of combustion processes, fire development, and firefighting; systems for preventing, limiting the spread, and localizing fires.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the final grade	Rating assessment on a 100-point scale: current control – 60 points (protection of laboratory work, protection of the control work, writing 2 module test controls (12 points – 6 points for each)); final control – 40 points, differentiated credit.
Preparatory course units	Required mandatory preliminary modules (school curriculum subjects): "Physics", "Life Safety and Fundamentals of Occupational Safety."
Educational material of reference	State Building Code DBN B.1.1-7:2016 Fire safety of construction objects. General requirements



Name	Creative thinking
ECTS credits	3
Year / Semester	1/2°
Specific learning outcomes	As a result of studying the discipline, the student will be able: to observe the problems and tasks from different perspectives and to discover new, unexpected solutions; to analyse and to evaluate ideas, proposals and solutions in terms of their effectiveness, innovativeness and potential risks; to communicate and to collaborate effectively in team projects and collective creativity; to apply creative thinking methods when solving the problems and developing innovative ideas; to reflect on your own thinking and to evaluate own successes, shortcomings and areas for further development.
Contents	Creativity and art. Creative personality. The art of creative thinking. Selection of the task. Methods of creative thinking.
Teaching and learning methods	24 hours in contact and online
Teaching techniques	Online Lectures 12 hours Laboratory works in contact 12 hours
Methods of monitoring	Oral and written control in the form of the control work.
Assessment criteria	The differentiated credit will be conducted in the form of tests on the NUCP`s platform of remote education "Moodle". During the differentiated credit, students should demonstrate their knowledges of the concept of creative thinking, the stages of the creative process, its role in the modern world and in various spheres of life; the factors that contribute to the development of creative thinking; the various techniques of ideas generation, such as brainstorming, associative thinking, mindmapping, the principle of "six hats", "fake faces", "chest of ideas", "dissected cherry", "SCAMPER questions", etc.; the basic concepts and principles of intellectual property law.
Assessment metrics	Differentiated credit
Criteria of attribution of the final grade	The training programme provides a differentiated credit. A student may receive up to 80% of the final grade for the completion of all types of tasks that are performing during the semester and up to 20% of the final grade for the differentiated credit.
Prerequisites	It is necessary to possess both the skills to make presentations and the ability to interact effectively with the team.
Educational material of reference	Chris Griffiths, Melina Kosti Guide to creative thinking / Translated by Ulyan Kurganov - Fabula Publishing House, 2020. - 288 p. (in Ukrainian)



Name	Time management
ECTS credits	3
Year / Semester	1/2°
Specific learning outcomes	As a result of studying the discipline, the student will be able: to analyse the use of time; to identify chrono-phages and to apply the methods of their elimination/neutralisation; to formulate life goals using the "goal tree" and SMART technologies; to use technologies for planning their own time; to apply tools to improve the efficiency of time use.
Contents	Self-management as a model of self-development. The concept and principles of effective time management. Time as a strategic resource. Analysis of time costs. Goal setting in the time management system. Methods of time planning. Control in the time management. Increasing the efficiency of time use.
Teaching and learning methods	24 hours in contact and online
Teaching techniques	Online Lectures 12 hours Laboratory works in contact 12 hours
Methods of monitoring	Oral and written control in the form of the control work.
Assessment criteria	The differentiated credit will be conducted in the form of tests on the NUCP`s platform of remote education "Moodle". During the test, students should demonstrate their knowledges of the main categories, tasks, laws, principles and methods of time management; the time management processes and its components; the factors of shortage of working and personal time; the main time absorbers and the methods of their overcoming; the time management strategies; goal setting in the time management system; the time planning methods and the ways to improve the efficiency of time use.
Assessment metrics	Differentiated credit
Criteria of attribution of the final grade	The distribution of points assigned to students in the discipline "Time management" is divided into the following categories: current control: carrying out practical tasks - 90 points (90%); final control: differentiated credit - 10 points (10%).
Prerequisites	It is necessary to possess both the skills to make presentations and the ability to interact effectively with the team.
Educational material of reference	Brian Tracy. Time management. 2013. 138 p. URL: https://www.amanet.org/assets/1/6/time-management-mini.pdf



Name	Communication technologies
ECTS credits	3
Year / Semester	1/2°
Specific learning outcomes	As a result of studying the discipline, the student will be able: to organise a communication environment; to create a communication strategy for an institution/organisation; to distinguish of fake information from true information; to think critically; to use a client-centred communication approach; to establish effective communication with stakeholders; to lead a discussion, organise working meetings; to organise and conduct negotiations; to organise business conversations by phone and using digital technologies; to create a crisis communication plan and to form the necessary team; to use PR tools; to prepare and present a public speech.
Contents	Communication technologies. Features of the organisation of communication space. Psychological aspects of communication technologies. Dissemination of information, critical thinking, information management. Forms of communication between people in the team: conversation, discussion, meeting, remote communication. Organisation of a crisis communication system. PR as an information technology. Technology of negotiations. Technology of speech preparation and its presentation.
Teaching and learning methods	24 hours in contact and online
Teaching techniques	Online Lectures 12 hours Laboratory works in contact 12 hours
Methods of monitoring	Oral and written control in the form of the control work.
Assessment criteria	The differentiated credit will be conducted in the form of tests on the NUCP's platform of remote education "Moodle". During the differentiated credit, students should demonstrate their knowledges of the basic theoretical concepts of the communication process; communication technologies in professional activities; psychological aspects of communication processes; theoretical basis of information dissemination; principles and rules of critical thinking and information management; rules of having a conversation, discussion, meeting; peculiarities of organising remote (digital) communication; basics of crisis communication and peculiarities of preparing a crisis communication plan; PR tools in professional activities; peculiarities of organising and conducting negotiations; the rules for preparing and presenting a public speech.
Assessment metrics	Differentiated credit
Criteria of attribution of the final grade	The training programme provides a differentiated credit. A student may receive up to 90% of the final grade for the completion of all types of tasks that are performing during the semester and up to 10% of the final grade for the differentiated credit.
Prerequisites	It is necessary to possess both the skills to make presentations and the ability to interact effectively with the team.
Educational material of reference	Communication of local self-government bodies: a practical guide for officials / Editors: I. Lepyoshkin, D, Konyk. Federation of Canadian Municipalities. International technical assistance project "Partnership for the development of cities", 2019. 42 p. (in Ukrainian)



Name	Training Course: Fundamentals of Startups
ECTS credits	3
Year / Semester	1/2°
Specific learning outcomes	To know the key stages of a startup's development, and understand the difference between a startup and a traditional business. Be able to develop business models using the Business Model Canvas, adapting them to the specifics of the construction industry. Make a financial plan for a startup. Students should understand the concept of MVP (Minimum Viable Product) and be able to develop a minimum viable product, test it on the market, collect feedback for further improvement, analyze the market, determine the target audience, and develop effective marketing strategies. To know about modern innovative solutions in construction. Be aware of the legal aspects of entrepreneurship. Have startup management skills. Be able to analyze risks, and create plans to minimize them. Be able to present your startup to investors and other interested parties effectively.
Contents	Introduction to Startups: Concept and Life Cycle. Business models for start-ups in construction. Financial planning and funding sources for startups. Innovations and technologies in the construction industry. Startup Marketing: Strategy and Tools. Startup pitching: presentation and attracting investors.
Teaching and learning methods	24 hours in contact and online
Teaching techniques	Online Lectures 12 hours Practical classes in contact 12 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The differentiated credit will be conducted in the form of tests on the university's Moodle distance education platform. During the test, students must demonstrate both theoretical knowledge and practical skills in the creation and development of a startup.
Assessment metrics	Differentiated credit
Criteria of attribution of the final grade	During the semester the students can achieve a maximum grade of 100 points, which is made up of 60 points after successfully passing practical work, and 40 points for an differentiated credit.
Prerequisites	Understanding of key processes, technologies and requirements relevant to the specialty. Students must know basic economic principles, have knowledge of the basics of entrepreneurship. It is useful to have an idea about modern technologies that can be implemented in construction startups, in particular, in the field of "green" construction, smart technologies and sustainable development. It is important to have the skills of creative thinking and solving non-standard problems, as well as the skills of pitching, presentations, the ability to effectively interact with the team and potential investors.
Educational material of reference	Ries, Eric. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business, 2011. 336 p. Thiel, Peter. Zero to One: Notes on Startups, or How to Build the Future. Crown Business, 2014. 224 p.



Name	Technologies for modeling building structures
ECTS credits	6
Year / Semester	I/1°
Specific learning outcomes	Work in modern universal and specialized information complexes for modelling of constructions. Develop project documentation according to technical standards, conditions and other regulation documents. Perform information modelling buildings with use of modern software complexes. Export the information model and convert it into a calculation model using the integration of several programs.
Contents	Technologies of information modeling for buildings designing. Autodesk Revit - General information about the program. General information about Revit - Tools. BIM technologies in construction design. Integration of software tools - the basis BIM technologies.
Teaching and learning methods	48 hours in contact and online
Teaching techniques	Online Lectures 26 hours Practical classes in contact 22 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The exam will conduct in form of a practical task on the Chernihiv Polytechnic National University`s platform of remote education "Moodle". The exam will take place in the form of a practical task on processing a construction project. It is necessary to demonstrate knowledge and skills in working with load-bearing structures, decoration, calculation of material consumption, development of project documentation.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the final grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 60 points after a success passing of practical work and 40 points of an exam grade.
Prerequisites	The educational component is based on knowledges of construction mechanics, building structures, metal structures, reinforced concrete and stone structures, architecture buildings and structures, foreign language, engineering, and computer graphics in construction.
Educational material of reference	BIM handbook: a guide to building information modeling for owners, managers, designers, engineers, and contractors / Chuck Eastman, Paul Teicholz, Rafael Sacks and Kathleen Liston – 2008. – 491p. Revit software complex for students - https://www.autodesk.com/education/students



Name	Inspection of Buildings and Structures
ECTS credits	5
Year / Semester	I/I°
Specific learning outcomes	<p>On successful completion of this module students should be able to:</p> <ol style="list-style-type: none"> 1 – understand the main term and definition related to the buildings and structures inspection. Differentiate the main categories of building`s and structure`s technical condition. Have an extensive knowledge of the regulatory framework. 2 – know the structure defects of reinforced concrete buildings caused by physical and mechanical damages and the reasons of bear-load capacity deterioration. Apply the obtained knowledge for the structural damages identification. Carry out plan checking and site inspection. Formulate tasks for the further comprehensive building`s inspection. 3 – diagnosis of cracking pattern of reinforced concrete. Familiarise with up-to-date methods of crack`s observation including the BIM technology of data collection. 4 – use of cutting-edge technologies and advanced information and computer tools for the determination of durability and bear-load capacity of buildings and its elements including the measurements, mechanical tests, ultrasonic pulse velocity tests, magnetic field tests, VR + laser scanning and drone shooting technics, etc. 5 – be able to manage the obtained data effectively, stitching of a cloud of points, develop of information model based on a collected data, make a logical recommendation, and devise innovative solution. 6– track down the latest achievements in the chosen specialization, apply them for innovations creation. 7 – to use knowledge and understanding of the principles of reliability of building systems, design, construction, operation and reconstruction of ecological and energy-saving buildings and structures using building information modeling.
Contents	<p>Intro. Main terms and definition. Physical and moral wear of concrete`s buildings and structures including overloading, freeze and thaw, shrinkage, fire damage. Chemical damages of concrete`s buildings and structures. The corrosion inducing influences as carbonation and chloride penetration. Methods, equipment and regulatory framework for pre-testing (visual inspection of concrete buildings). Methods and equipment for reinforced concrete`s building and structure crack observation. Basic information about non-destructive methods of testing of concrete`s building and structure. Mechanical methods and equipment of reinforced concrete strength inspection (Cut and Pull-Out Tests, Rebound Hammer Tests, Elastic Rebound Tests). Methods and equipment for Ultrasonic Pulse Velocity Tests of concrete`s and metal`s element (Direct, Semi-direct and Surface methods of UPVT data collection). The sensors for UPVT of reinforced concrete and metal structures. Methods and equipment for reinforced concrete`s and metal`s structure testing in applied magnetic field (Magnetic Memory Method, The Magnetic Flux Leakage Method, The Magnetic Powder Method for data collection). The sensors of magnetic method of tests (Rotating magnetic field sensors, Several stationary magnetic field sensors) for data collection. The application of methods and equipment relied on a BIM technology for existing buildings and structures inspection (VR + laser scanning or VR + drone inspection). Basics of information model creation using of BIM software systems. Carrying out of calculations based on the data, collected while using of non-destructive methods of tests in order to create of information models for weak links identification.</p>



Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 26 hours Practical classes in contact 14 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". The test contains the questions related to the type of defects and their impact on reinforced concrete's building and structure's bear-load capacity as well as choice of an appropriate method of building's and structure's inspection. Students should be able to demonstrate skills in assessment of building's and structure's technical and operational condition as well as operating with the specific method of building's inspection.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 25 points after a success passing of practical workshops; 15 points of computational and graphic work; 20 points of semester test and 40 points of an exam grade.
Prerequisites	The students should possess the elementary knowledge of math calculation, spatial and abstract mindset, be able to use the theoretical and practical skills in math, chemistry and physics.
Educational material of reference	State Building Code DBN B.1.2-18:2016 Inspection of buildings and structures for assessment of their technical condition Parker, Г. W., Nurse, R. W., and Bcscsy, G. E., "Investigations on Building Fires. Part 1: The Estimation of the Maximum Temperature Attained in Building Fires from Examination of the Debris, and Part II: The Visible Change in Concrete or Mortar Exposed to High Temperatures," National Building Studies, Technical



Name	BLM technologies
ECTS credits	4
Year / Semester	1/2 °
Specific learning outcomes	Design building load-bearing structures with an integrated approach, taking into account the lifecycle of resources. Analyze the lifecycle of the load-bearing frames of buildings, determine the ecological and economic advantages of using building materials depending on the project tasks.
Contents	Life cycle of buildings. Regulatory support in building. Building life cycle assessment tools. Life cycle decision assessment and calculations model. Calculation of environmental assessment and life cycle cost.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 18 hours Practical classes in contact 14 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The final test will conduct in a form of a practical task on the Chernihiv Polytechnic National University's platform of remote education "Moodle". The test will take place in the form of a practical task on processing a construction project. It is necessary to demonstrate knowledge and skills to analyze the life cycle of the building, evaluate the environmental and economic indicators of its operation.
Assessment metrics	Semester control and differentiated credit grade
Criteria of attribution of the final grade	The final grade is 100 points (maximum): - semester control: academic performance - 30 points, practical classes - 40 points; - final control (differentiated credit) - 30 points.
Prerequisites	The educational component is based on knowledge of construction mechanics, building structures, metal structures, reinforced concrete and stone structures, architecture buildings and structures, foreign language, engineering, computer graphics in construction, knowledge in the field of economics of constructions, maintenance of engineering networks.
Educational material of reference	Bilyk A.S. Ecological and economic lifecycle analysis of building frames: monograph. – K.: USCC, KNUCA, 7BC, 2022. – 263 c.



Name	Innovative engineering and construction technologies
ECTS credits	5
Year / Semester	I/ 2 °
Specific learning outcomes	The purpose of the course "Innovative engineering and construction technologies" is to provide the higher education applicant with the necessary knowledge, practical skills and competences in innovative technologies for the production of building materials, as well as the design and construction of construction objects. The study of the discipline involves consideration of modern principles of development of the composition of construction mortars and concretes as a complex composite material. At the same time, both our own work and the recommendations of manufacturers of construction chemicals are used. The course examines reinforced and high-performance concrete, features of application and production of structures from the considered materials.
Contents	The influence of chemical impurities. Deformative properties of modern commercial concrete. Corrosion of concrete and ways to protect reinforced concrete structures. The influence of temperature on the rate of hardening of concrete. Types of heavy concrete. Fine-grained concrete. Use of lightweight concrete. Types of fillers. Special types of concrete. Special concretes. Building solutions and the use of composites in construction. Preparation of concrete mixture. Concreting of monolithic structures in adverse weather conditions. Mathematical methods in modern concrete technology. Increasing the efficiency of concrete. Ways of development of concrete technology.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 26 hours Laboratory classes in contact 14 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". During the testing, students should know the modern trends in concrete production and the basics of their mathematical modeling.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the final grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 35 points after a success passing of practical work; 25 points of semester test and 40 points of an exam grade.
Prerequisites	Basic knowledge of materials science and construction chemistry is required.
Educational material of reference	Safiuddin, Md & Durazno Flores, Herman. (2018). New Materials, Products, or Technologies for Construction. 10.13140/RG.2.2.19396.53127.



Name	Reconstruction and modernization of building systems
ECTS credits	6
Year / Semester	I/1°
Specific learning outcomes	The ability to apply knowledge and understanding of the principles of reliability in building systems, design, construction, operation, and reconstruction of ecological and energy-efficient buildings and structures using building information modelling.
Contents	Specifics of realization of architectural heritage renovation and selection of appropriate construction technologies. Principles of realization of architectural heritage restoration. Surveys and researches undertaken in a frame of buildings renovation, findings on building site. Repair of constructions, affected by ground moisture. Repair of failed masonry (walls, vaults, columns). Protection and repair of wooden constructions, dealing with their damages. Repair of stairs and chimneys. Creation of openings in masonry. Repair of fundaments. Protection of wooden constructions. Repair of roofs. Repair of surfaces. Excursions into repaired buildings.
Teaching and learning methods	48 hours in contact and online
Teaching techniques	Online Lectures 26 hours Lab work 22 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". The test contains the questions related to the researches in a frame of buildings renovation, repair of failed masonry, wooden structures fundaments and architectural heritage renovation. Students should be able to demonstrate skills in making effective decisions regarding the reconstruction of objects based on conducted surveys and research.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 33 points after a success passing of lab work; 12 points of control work; 15 points of semester test and 40 points of an exam grade.
Preparatory course units	Required knowledge of basic mathematical calculations, spatial and abstract thinking
Educational material of reference	Bruno Daniotti, Sonia Lupica Spagnolo, Alberto Pavan, Cecilia Maria Bolognesi Innovative Tools and Methods Using BIM for an Efficient Renovation in Buildings. Switzerland: PoliMI SpringerBriefs, 2022. 121 p. Alexander Newman Structural Renovation of Buildings. Methods, Details, and Design Examples. Second Edition. New York: McGraw Hill, 2021. 693 p.



Name	Technology of special buildings and structures construction
ECTS credits	5
Year / Semester	I/I°
Specific learning outcomes	<p>On successful completion of this module students will:</p> <ol style="list-style-type: none"> 1 - gain a diverse knowledge in the latest constructional techniques and innovative approaches applied to design, planning, engineering techniques and constructional sequence for: substructures; high-rise special structures; long-span unique structures; shell frame and solid structures; 2 - be able to understand the organization of works on the construction of special buildings and structures; 3 - gain the in-depth knowledge in rehabilitation and strengthening techniques of special structures, as well as restoration of special or unique buildings and structures; 4 - be able to carry out technical and economic substantiation of design decisions during the special buildings and structures construction; 5 - apply modern mathematical methods for statistical data analysis, calculation and optimization of design parameters and technological processes of construction of special buildings and structures; 6 - solve the construction and civil engineering problems in new or unfamiliar environments in the presence of incomplete or limited information, taking into account aspects of social and ethical responsibility, to solve professional tasks taking into account the requirements of civil protection and labor protection.
Contents	Intro. Main terms and definition. Installation of beam structures, frame structures, arched coverings, domes, cable coverings. Constructional sequence in spherical tanks and gas holders, cooling towers, silos, chimney. Installation of vertical tanks. Installation of power lines and radio mast. Constructional sequence in bowstring bridges, cable stayed bridges. The difficulties in construction of jetties and breakwater structures. Support structures in heavy equipment and machinery in heavy industries. Technologies of erection of articulated structures and space decks. Summary.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 26 hours Practical classes in contact 14 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". The test contains the questions related to the peculiarities of the special building's and structure's installation techniques and sequences tailored to their unique design and purpose. Students should be able to demonstrate the deep knowledge of the relevant topic of discipline and its main provisions.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 25 points after a success passing of practical workshops; 15 points of computational and graphic work; 20 points of semester test and 40 points of an exam grade.



Prerequisites	The students should possess the elementary knowledge of math calculation, spatial and abstract mindset, be able to use the theoretical and practical skills in math, chemistry and physics.
Educational material of reference	State Building Code DBN B.2.6-203:2015 Instructions for the execution of works in the manufacture and installation of building structures Chew, Michael Yit Lin, Construction Technology for Tall Buildings, WORLD SCIENTIFIC, 2012, 428p. Vivian W.Y. Tam, Khoa N. Le, Sustainable Construction Technologies, Butterworth-Heinemann, 2019, 476p.



Name	Building structures of buildings and constructions from the 17th to the 20th centuries
ECTS credits	4
Year / Semester	I/I°
Specific learning outcomes	Gather the necessary information using scientific and technical literature, databases and other sources, analyze and evaluate it. Solve the problems of construction and civil engineering in new or unfamiliar environments in the presence of incomplete or limited information, taking into account the aspects of social and ethical responsibility, to solve professional tasks taking into account the requirements of labor protection.
Contents	Review of literature used for designing buildings and structures in the 17th-20th centuries. Geotechnical design. Underground complexes. Typical constructions of buildings and structures from the 17th-20th centuries. Structural features of old buildings. Determining the residual resource of old buildings. Calculation of stone and wooden structures of buildings from the 17th-20th centuries. Features of panel buildings.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 18 hours Lab work 14 hours
Methods of monitoring	Oral control and written control in form of tests
Assessment criteria	The exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". The test includes questions related to methods for assessing the geospace and the structural features of the 17th-20th centuries. Students must demonstrate the ability to survey old buildings, assess their reliability, and calculate the stone and wooden structures of these buildings.
Assessment metrics	Semester control and Exam grade
Criteria of attribution of the grade	During semester the students can achieve a maximum grade of 100 points, which is made up of 35 points after a success passing of lab work; 25 points of semester test and 40 points of an exam grade.
Preparatory course units	Required knowledge of basic mathematical calculations, spatial and abstract thinking.
Educational material of reference	History of Construction Cultures Volume 1. Proceedings of the 7th International Congress on Construction History (7ICCH 2021), July 12-16, 2021, Lisbon, Portugal History of Construction Cultures Volume 2. Proceedings of the 7th International Congress on Construction History (7ICCH 2021), July 12-16, 2021, Lisbon, Portugal



Name	Energy saving and energy audit in construction
ECTS credits	5
Year / Semester	1/2°
Specific learning outcomes	<p>On successful completion of this module students should be able to:</p> <ol style="list-style-type: none"> 1 - use systematic thinking, apply the obtained knowledge and skills to formulate new ideas and solve problems in the design, construction and operation of energy efficient buildings, structures and civil engineering; 2 - apply the obtained knowledge and understanding to identify, formulate and solve tasks of construction of energy efficient buildings, structures and civil engineering, using known methods; 3 - diagnose the energy efficiency of buildings, structures and civil engineering to optimise energy consumption; 4 - possess skills of relevant techniques in the development of modern technologies for the construction of energy-efficient buildings, structures and civil engineering 5 - possess skills to comply with the rules of occupational safety, behaviour in extreme situations, etc; 6 - demonstrate oral and written communication skills in the state and foreign languages, using interpersonal skills during interaction in an international context with specialists and non-specialists in the field of construction and civil engineering; 7 - Use of modern communications tools. Ability to understand and consider the needs of users, as well as social, environmental, psychological, ethical, economic and commercial considerations in the design of construction projects and the implementation of technical solutions in construction.
Contents	<p>Sustainability in the construction sector. Criteria and assessment systems in sustainable construction. Sustainable architecture and design in the green building context. Sustainable practices in concrete manufacturing. Comfort, environmental friendliness, energy efficiency; technical requirements for the design of a highly efficient building envelope and design of engineering systems. Green buildings. "Passive House". Criteria and principles of passive house construction. Familiarize with the Passive House Data Package (PHDP). Near-zero energy building concept: "Energy +", "Active House" building technologies. General requirements for energy certification and parameters for determining the energy efficiency of buildings. Procedure for energy efficiency certification. Methodology for determining the energy efficiency of buildings. Application of cutting-edge technologies for the energy efficiency enhancement of buildings and structures. Software calculation elements for determination of the energy efficiency of buildings.</p>
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures of 26 hours Practical Workshops of 14 hours in contact
Methods of monitoring	Oral and written control in form of tests
Assessment criteria	<p>Exam will conduct in form of tests on the Chernihiv Polytechnic National University's platform of remote education "Moodle". During the exam, the students will be required to solve test questions relating to measuring air humidity, dew point, air velocity, microclimate parameters and air quality. Students should be able to demonstrate skills in instrumental energy auditing, and calculate thermal conductivity and heat transfer.</p>



Assessment metrics	Semester control and Exam grade
Criteria of attribution of the final grade	During the semester, the students can achieve a maximum grade of 100 points, which is made up of 25 points after a success passing of practical workshops; 15 points of computational and graphic work; 20 points of semester test and 40 points of an exam grade.
Prerequisites	The students should possess the elementary knowledge of math calculation, spatial and abstract mindset, be able to use the theoretical and practical skills in math, chemistry and physics.
Educational material of reference	State Building Code DBN B.1.2-11:2021 Energy saving and Energy efficiency. Albert Thumann, Terry Niehus, William J. Younger, Handbook of Energy Audits, Ninth Edition, River Publishers, 2012, 506 p. Steve Doty, Commercial Energy Auditing Reference Handbook, Third Edition: Reference Handbook, River Publishers; 3rd edition, 2016, 1102 p.