Attachments

BIM TECHNOLOGY IN CONSTRUCTION AND CIVIL ENGINEERING

Curriculum - Academic Year 2024-25

Year/ Semester	Course Unit	ECTS credits	Lecturer(s)	Qualification
I/2°	Foreign language oriented to science	*3,0*	*Lecturer 1*	*Associate Prof.*
1/1°	Optional course *	*4,0*	*Lecturer 2*	
1/1°	Occupational safety in the field	*3,0*	*Lecturer 3*	*Associate Prof.*
1/1°	Architectural BIM design of buildings and structures	*4,0*	*Artem SOPILNIAK*	*Associate Prof.*
I/1°	Geotechnical BIM design in construction	*4.0*	*Lecturer 5*	*Associate Prof.*
1/1°	BIM design of reinforced concrete structures of buildings and special purpose structures	*4.0*	*Lecturer 6*	*Associate Prof.*
1/1°	BIM design of metal structures of critical buildings and structures	*4.0*	*Lecturer 7*	*Associate Prof.*
1/2°	Digitalization in the field of construction and energy efficiency	*4.0*	*Lecturer 8*	*Professor*
1/2°	BIM technologies in construction processes	*4.0*	*Lecturer 9*	*Associate Prof.*
1/2°	Information technology in construction project management	*4.0*	*Lecturer 10*	*Associate Prof.*
1/1° 1/2°	Design of buildings and structures based on the BIM model (optional course)	*7,0*	*Lecturer 11*	*Professor*
1/1° 1/2°	Building life cycle design according to sustainable development criteria (optional course)	*7,0*	*Lecturer 12*	*Professor*
1/1° 1/2°	Information technologies for engineering systems design (optional course)	*8,0*	*Lecturer 13*	*Associate Prof.*
1/1° 1/2°	BIM technologies in engineering networks design (optional course)	*8,0*	*Lecturer 14*	*Associate Prof.*
1/2°	BIM modelling of construction objects erected using 3D printing technology (optional course)	*4,0*	*Lecturer 15*	*Professor*
1/2°	Design of energy efficiency for buildings using the BIM model (optional course)	*4,0*	*Lecturer 16*	*Professor*
1/2°	Computer 3D modelling of buildings and structures	*3,0*	*Lecturer 17*	*Associate Prof.*
1/2°	Parametric design of critical buildings and structures	*6*	*Lecturer 18*	*Associate Prof.*
2/2°	Research training	*6.0*	*Lecturer 19*	*Associate Prof.*
2/2°	Execution and defense of Master Thesis	*24.0*	*Lecturer 20*	*Associate Prof.*
	Total ECTS credits	*90,0*		

Syllabi - Academic Year 2024-25
Characteristics of the Course Units

Name	Foreign language oriented to science
ECTS credits	3,0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: 1 - perform communicative, cognitive and developmental tasks; 2 - to read and translate original literature in the speciality, to make lexical and grammatical analysis of the texts read; 3 - make presentations and participate in formal and informal conversations for various forms of cooperation; 4 - to communicate orally in monologue and dialogue in the speciality and on socio-political issues (report, message, discussion, etc.) 5 - communicate in writing on topics related to scientific activities and general technical topics (abstracts, annotations, abstracts, etc.).
Contents	The course 'Scientific Foreign Language' is aimed at improving the skills and abilities of practical foreign language proficiency and foreign language oral and written professional communication. A significant role is given to improving academic writing skills and the ability to prepare presentations and reports in the field, to develop learning autonomy through independent and individual tasks, which will encourage lifelong learning and self-education.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Practical classes in contact 32 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	In the final exam students should demonstrate the ability to read a text related to the design of buildings using BIM technologies, complete a listening task, a written task and a conversation with a teacher on the topic of the thesis.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content module consists of: - reading of the text related to the design of buildings using BIM technologies -25 points - performing a listening task -25 points - written assignment -25 points - conducting a conversation with the teacher on the topic of the thesis -25 points
Preparatory course units	«Foreign language oriented to science» «Foreign language oriented to specialty»
Educational material of reference	- English in the Fields of Science and Research: https://englishlive.ef.com/blog/career-english/science-vocabulary/ - BIM Handbook A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors URL: https://hvacsimplified.in/wp-content/uploads/2022/05/4_5879807870286957058.pdf

Name	Optional course. 1.1 Building physics
ECTS credits	4,0
Year / Semester	1/1
Specific learning outcomes	On successful completion of this module students should be able to: - to apply BIM technologies in the design of building structures, accounting for acoustic and vibration effects and the spatial distribution of optical radiation.
Contents	The course 'Building Physics' is aimed at developing students' theoretical and practical skills in innovative methods and techniques for designing and developing new urban planning principles that help protect residential buildings from acoustic noise, shock and vibration impact and the use of both natural and artificial lighting systems in the built environment.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 32 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	Final test consists of 50 questions are graded: 2 points for a correct answer, 0 points for an incorrect answer.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content module consists of module grade sum.
Preparatory course units	Occupational safety in the field
Educational material of reference	- Zhydkova T. V., Apatenko T. M. Building physics. Kharkiv, National Academy of Urban Economy named after O. M. Beketov. 2018. 405 p. - Nazarenko L.A., Ioffe K.I. Artificial outdoor lighting: Textbook for the course «Lighting of cities». Kharkiv, National Academy of Urban Economy named after O. M. Beketov. 2008. 122 p.

Name	Occupational safety in the field
ECTS credits	3,0
Year / Semester	1/1
Specific learning outcomes	On successful completion of this module students should be able to: 1 - to be guided by the legislation of Ukraine and the requirements of regulatory legal acts on labour protection in construction, the rights and obligations of workers; 2 - to identify in a timely manner the reasons that may lead to an accident in the construction environment, 3 - develop measures to ensure labour safety during construction works.
Contents	Occupational safety in the field is a mandatory course to provide students with up-to-date knowledge of the mechanisms for occurrence of hazardous and harmful production factors in construction and their characteristics, to develop the skills necessary for the future practical activities of a specialist to prevent them and protect workers, and to develop creative thinking to solve the problem of improving occupational safety in construction.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 24 hours Practical classes in contact 8 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	In the final exam students should demonstrate knowledge of the hazards' prevention in construction and the protection of workers on the construction site, ways to solve problems of improving labour protection in construction.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content module consists of: - student attendance at lectures - 1 point per lecture; - performing and defense of practical work - 40 points; - final test - 49 points.
Preparatory course units	«Fundamentals of occupational safety», «Technology of construction production», «Erection of buildings and structures», Special course
Educational material of reference	- - Engineering solutions for occupational safety in the development of diploma thesis for engineering and construction specialties / Edited by V. Safonov - Kyiv: Osnova, 2020 - 480 p. - - State Building Code DBN A.3.2-2-2009 «Protection of labour and industrial safety in building construction»

Name	Architectural BIM design of buildings and structures
ECTS credits	4,0
Year / Semester	1/1
Specific learning outcomes	On successful completion of this module students should be able to: 1 - use Revit templates to develop information models of buildings and structures; 2 - to know REVIT applications, including those used for building visualisation; 3 - develop and edit albums of architectural and construction drawings in REVIT in accordance with acting standards.
Contents	The course «Architectural BIM Design of Buildings and Structures» is aimed at preparing students to use methods of building information modelling (BIM) in the process of architectural design. The course provides knowledge of BIM technologies in architectural design, the principles of their application in the design of buildings and structures, as well as practical skills in working with software used to develop complex digital models of building objects.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 8 hours Practical classes in contact 24 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	In the final exam students should demonstrate knowledge of practical skills of effective use of information modelling technologies in architectural and construction design
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content module consists of: - student attendance at lectures - 40 points; - performing and defense of practical work - 60 points.
Preparatory course units	«Descriptive Geometry, Engineering and Computer Graphics», «Architecture of buildings and structures», «Fundamentals of BIM technologies (REVIT)»
Educational material of reference	- A guide to the implementation of information modelling in construction, created by the European public sector: https://www.eubim.eu/wp-content/uploads/2020/12/2017_EU-BIM-Handbook_ua.pdf - BIM and ISO 19650: https://iceg.com.ua/wp-content/uploads/2019/11/EFCA_Flipbook_BIM_ukr_.pdf

Name	Geotechnical BIM design in construction
ECTS credits	4,0
Year / Semester	1/1
Specific learning outcomes	On successful completion of this module students should be able to: - apply BIM technologies in the design of new building foundations in particularly difficult geological conditions - to apply BIM technologies in the development of measures to strengthen the foundations of existing buildings on a natural basis, on an artificial basis and on piles; in engineering and geological surveys and inspection of foundations.
Contents	The course is aimed at developing systematic knowledge and understanding of the conceptual principles of building reconstruction and foundation reconstruction using BIM technologies. This involves the acquisition of theoretical knowledge by students on the determination of factors affecting the level of reliability of foundations and foundations; the concept of the theory of reliability of foundations and foundations; general classification of foundation failures; strengthening and reconstruction of shallow foundations; strengthening and reconstruction of foundations located in specific conditions; strengthening and reconstruction of pile foundations.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 16 hours Practical classes in contact 24 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	Final test consists of 50 questions are graded: 2 points for a correct answer, 0 points for an incorrect answer.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The final grade is calculated as the arithmetic average between the grades of the content module and the examination grade.
Preparatory course units	«Engineering geology», «Principles of Soil Mechanics», «Bases and foundations»
Educational material of reference	- State Building Code DBN V.2.1-10:2018 Bases and foundations of buildings and structures. Main principles – Kyiv, 2018. - State Building Code DBN V.1.1-24:2009 Protection against hazardous geological processes. Main principles – Kyiv, 2010.

Name	BIM design of reinforced concrete structures of buildings and special purpose structures
ECTS credits	4,0
Year / Semester	1/1
Specific learning outcomes	On successful completion of this module students should be able to: - apply BIM technologies in the design of structures of buildings and special purpose structures - apply BIM technologies in the development of measures to strengthen the structures of existing buildings and special purpose structures, defects and damage of which were detected during routine inspections or in emergency situations.
Contents	The course «BIM design of reinforced concrete structures of buildings and special purpose structures» is aimed at providing students with comprehensive knowledge and skills in the use of building information modelling (BIM) technologies for the design of reinforced concrete structures intended for special facilities. The course covers the theoretical foundations and practical aspects of BIM design, including the creation of digital models, analysis and optimisation of structures, and integration with other building systems. The main topics of the course are: principles of BIM technologies, peculiarities of designing reinforced concrete structures for special purpose facilities, methods of analysis and assessment of their reliability and durability.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 24 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	Final test consists of 50 questions are graded: 2 points for a correct answer, 0 points for an incorrect answer.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content module consists of exam grade.
Preparatory course units	«Theoretical mechanics», «Resistance of materials», «Reinforced concrete structures»
Educational material of reference	- State Building Code DBN V.2.6-98:2009 The constructions of buildings and structures. Concrete and reinforced concrete structures. Main principles. With Amendment No. 1 – Kyiv, 2020. - State Standard of Ukraine DSTU B V.2.6-156:2010 Structures of buildings and erections.Concrete and reinforsed concrete snructures with heavy weight structural concrete. Design rules – Kyiv, 2011.

Name	BIM design of metal structures of critical buildings and structures
ECTS credits	4,0
Year / Semester	1/1
Specific learning outcomes	On successful completion of this module students should be able to: - develop an information model of a construction object; - use software systems to develop and manage an information model; - perform automated calculations and design of components and joints of metal structures and buildings
Contents	Design of metal structures of critical buildings and structures using BIM technologies covers the basics of computer modelling, calculation and design methods. Three-dimensional modelling has led to a significant improvement in the approaches to the design of metal structures. The use of BIM computer modelling technologies allows solving complex engineering problems, increasing the accuracy and automation of metal structure design.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 24 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	Final test consists of 50 questions are graded: 2 points for a correct answer, 0 points for an incorrect answer.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is calculated as the arithmetic average between the grades of the content module and the examination.
Preparatory course units	«Theoretical mechanics», «Resistance of materials», «Metal structures»
Educational material of reference	- State Building Code DBN V.1.2-14-2018 General principles for realibity and constructive safety ensuring of buildings and civil engineering works. – Kyiv, 2018 - State Building Code DBN V.2.6-198:2014 Steel structures. Design code. – Kyiv, 2018

Name	Digitalization in the field of construction and energy efficiency
ECTS credits	4.0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: - acquire knowledge of the use of digital technologies to improve the productivity and sustainability of building design, construction and operation; - acquire practical skills in the design of smart systems for monitoring and management of building facilities
Contents	The course «Digitalisation in in the field of construction and energy efficiency» is aimed at gaining comprehensive knowledge of the theoretical provisions and practical aspects of the digital technologies' implementation in construction and civil engineering to improve the productivity and sustainability of the design, construction and operation of buildings. The course provides for the development of application of the additive manufacturing concepts, robotics and drones, the Internet of Things and smart equipment, smart home and city, virtual and augmented reality, machine learning.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 32 hours Practical classes in contact 8 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	In the final exam students should demonstrate knowledge of buildings' design using energy-efficient BIM technologies
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content module consists of: - student attendance at lectures - 22 points; - student work at practical classes - 16 points; - independent work – 20 points; - performing of individual tasks – 20 points; - control work – 22 points.
Preparatory course units	- «Design of buildings and structures based on the BIM model» - «Building life cycle design according to sustainable development criteria»
Educational material of reference	- Digital Agenda of Ukraine – 2020. https://ucci.org.ua/uploads/files/58e78ee3c3922.pdf - Some issues of ensuring the functioning of the Unified State Electronic System in the field of construction, Cabinet of Ministers of Ukraine, resolution dated June 23, 2021 No. 681, Kyiv, https://zakon.rada.gov.ua/laws/show/681-2021-%D0%BF#n40

Name	BIM technologies in construction processes
ECTS credits	4,0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: - - create accurate and detailed digital models of construction projects that include all stages of the building life cycle, from conceptual design to operation and renovation. - - integrate architectural, engineering and construction solutions in BIM environment, which ensure the consistency and accuracy of projects, reducing the number of errors and the need for rework. - - use BIM technologies to analyse and optimise construction processes, including planning, resource management, cost and risk assessment. - - have skills in working with leading BIM modelling software, such as Revit, Navisworks, and other specialised tools. - - effectively manage data related to construction projects, ensuring the availability and accuracy of information for all project participants.
Contents	The course «BIM technologies in construction processes» provides students with in-depth theoretical knowledge and practical skills in creating and applying digital models of construction objects at all stages of their life cycle. The main topics are: the basics of information modelling, principles of design coordination, integration of architectural, engineering and construction solutions in the BIM environment, project data management, energy efficiency analysis, and optimisation of construction processes. Students learn to use specialised software for developing, analysing and managing BIM models, such as Revit, Navisworks and others.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 24 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	Final test consists of 50 questions are graded: 2 points for a correct answer, 0 points for an incorrect answer.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content module is calculated as the arithmetic average between the grades of the content modules.
Preparatory course units	«Technology of construction production», «Organisation of building»
Educational material of reference	- State Standard of Ukraine DSTU EN ISO 29481-1:2022. Building information models information delivery manual. Part 1: Methodology and format. - State Standard of Ukraine DSTU EN ISO 29481-2:2023 Building information models information delivery manual. Part 2: Interaction framework.

Name	Information technology in construction project management
ECTS credits	4,0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: - comprehend theoretical principles; - use practical skills in the information technologies in the management of construction projects -
Contents	The course is aimed at studying the principles of using information technologies in the management of construction projects
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 24 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The maximum exam grade is 100 points. The exam test consists of two theoretical questions. The grade goes from 0 (minimum) up to 50 points (maximum) for each question:
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module. The grade for the content modules is calculated as the arithmetic average between the grades of each content module.
Preparatory course units	«Technology of construction production», «Organisation of building»
Educational material of reference	- Zachko O. B., Ivanusa A.I., Kobylkin D.S. Project management: theory, practice, information technology. – Lviv, 2019. – 173 p. - State Building Code DBN A.3.1-5:2016 «Organization of construction production» - Kyiv, 2016

Name	Design of buildings and structures based on the BIM model (optional course)
ECTS credits	7,0
Year / Semester	1/1, 1/2
Specific learning outcomes	On successful completion of this module students should be able to: - develop buildings and structures with consideration of changes in the stress-strain state during their life cycle; - assess the environmental impact of buildings and structures during their life cycle.
Contents	The course «Design of buildings and structures based on the BIM model» is aimed at teaching students the basic methods and acquiring practical skills in the calculation and design of load-bearing structures of buildings and structures using the BIM model and with consideration of changes in the stress-strain state and environmental parameters at all stages of the life cycle (production, construction, operation and dismantling).
Teaching and learning methods	64 hours in contact and online
иTeaching techniques	Practical classes in contact 64 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The maximum exam grade is 100 points. The exam test consists of two theoretical questions and practical task. The grade goes from 0 (minimum) up to 30 points (maximum) for each theoretical question and from 0 (minimum) up to 40 points (maximum) for practical task.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade for the first semester is the grade for the content module. The grade for the second semester is calculated as the arithmetic average between the grades of the content module and the examination grade.
Preparatory course units	«Architectural BIM design of buildings and structures» « BIM design of reinforced concrete structures of buildings and special purpose structures» « BIM design of metal structures of critical buildings and structures»
Educational material of reference	- Barabash M.S. Computer modelling of life cycle processes of construction objects. Kyiv, 2014.-301 p. - Bilyk A.S. Environmental and economic analysis of the life cycle of building frames. Kyiv, 2022. – 263 p. - State Standard of Ukraine DSTU 9171:2021 Guidelines for ensuring a balanced use of natural resources in the design of structures.

Name	Building life cycle design according to sustainable development criteria (optional course)
ECTS credits	7,0
Year / Semester	1/1, 1/2
Specific learning outcomes	On successful completion of this module students should be able to: - develop buildings and structures with consideration of changes in the stress-strain state during their life cycle; - assess environmental impact for the design of buildings and structures corresponding to the criteria of sustainable development, with consideration all stages of the life cycle (production of materials, construction, operation and dismantling)
Contents	The course «Building life cycle design according to sustainable development criteria» is aimed at gaining comprehensive knowledge of the basic approaches and methods of modelling buildings and structures to assess the stress-strain state and environmental impact, with consideration of all stages of the life cycle (materials production, construction, operation and dismantling).
Teaching and learning methods	64 hours in contact and online
Teaching techniques	Practical classes in contact 64 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The maximum exam grade is 100 points. The exam test consists of two theoretical questions and practical task. The grade goes from 0 (minimum) up to 30 points (maximum) for each theoretical question and from 0 (minimum) up to 40 points (maximum) for practical task. :
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade for the first semester is the grade for the content module. The grade for the second semester is calculated as the arithmetic average between the grades of the content module and the examination grade.
Preparatory course units	«Architectural BIM design of buildings and structures» «BIM design of reinforced concrete structures of buildings and special purpose structures» «BIM design of metal structures of critical buildings and structures»
Educational material of reference	- Barabash M.S. Computer modelling of life cycle processes of construction objects. Kyiv, 2014.-301 p. - Bilyk A.S. Environmental and economic analysis of the life cycle of building frames. Kyiv, 2022. – 263 p. - State Standard of Ukraine DSTU 9171:2021 Guidelines for ensuring a balanced use of natural resources in the design of structures.

Name	Information technologies for engineering systems design (optional course)
ECTS credits	8,0
Year / Semester	1/1, 1/2
Specific learning outcomes	On successful completion of this module students should be able to: - - use modern information technologies for designing and creating 3D models of engineering networks and communications; - - work with information generated by modern information technologies for the design of engineering networks and communications; - - use modern information technologies for design coordination and solving conflicts.
Contents	The subject of the course is a clear understanding of modern information technologies' using for the design, integration and management of engineering systems, creation of three-dimensional models, analysis of system performance, data management and application of standards and software of modern information technologies to improve coordination and reduce errors in projects. The course covers the following issues: fundamentals of modern information technology; modelling of engineering systems (heating, ventilation); model integration and conflict detection; analysis and simulation of system performance; data management in modern information technology models.
Teaching and learning methods	72 hours in contact and online
Teaching techniques	Online Lectures 40 hours Practical classes in contact 32 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The exam test consists of 25 questions are graded: 4 points for a correct answer, 0 points for an incorrect answer.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade for the first semester is calculated as the arithmetic average between the grades of the content module and the examination grade. The grade for the second semester is the grade for the content modules.
Preparatory course units	«Heat and gas supply and ventilation», «Water supply and sewerage»
Educational material of reference	- State Building Code DBN V 2.5-64:2012 Internal plumbing and sewage system. Part I. Designing. Part II. Building - State Standard of Ukraine DSTU B A.2.4-41:2009 System of project documents for building. Heating, ventilation and air conditioning. Working drawings.

Name	BIM technologies in engineering networks design (optional course)
ECTS credits	8,0
Year / Semester	1/1, 1/2
Specific learning outcomes	On successful completion of this module students should be able to: - apply various methods of research and analysis of engineering systems using information technology; - apply practical skills of information technology to research and solve problems in engineering systems. - analyse the current trends in the development of modern information technologies in the context of engineering systems
Contents	The course «BIM in engineering networks design» offers students a comprehensive immersion in modern methods and practices of building information modelling (BIM). The course covers the theoretical foundations and practical skills of using BIM for virtual design, project collaboration and construction process management deep dive into modern methods and practices of building information modelling (BIM).
Teaching and learning methods	64 hours in contact and online
Teaching techniques	Online Lectures 32 hours Practical classes in contact 32 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The exam test consists of 25 questions are graded: 4 points for a correct answer, 0 points for an incorrect answer.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade for the first semester is calculated as the arithmetic average between the grades of the content module and the examination grade. The grade for the second semester is the grade for the content modules.
Preparatory course units	«Heat and gas supply and ventilation», «Water supply and sewerage»
Educational material of reference	- State Building Code DBN V 2.5-64:2012 Internal plumbing and sewage system. Part I. Designing. Part II. Building - State Standard of Ukraine DSTU B A.2.4-41:2009 System of project documents for building. Heating, ventilation and air conditioning. Working drawings.

Name	BIM modelling of construction objects erected using 3D printing technology (optional course)
ECTS credits	4,0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: - know the basic principles and technologies of 3D printing in construction, including materials, equipment and printing methods. - use BIM technologies to design and model buildings constructed using 3D printing technology. - use methods of optimising structures to ensure their strength, stability and cost-effectiveness when using 3D printing. - assess the economic advantages and disadvantages of using 3D printing in construction, including the cost of materials, equipment and work. - apply the principles of sustainable development and environmental aspects of 3D printing in construction, including waste and energy reduction.
Contents	The course «BIM modelling of construction objects erected using 3D printing technology» of construction objects using 3D printing technology' is aimed at studying the features of 3D printing technology and equipment and its integration with information modelling methods, basic building materials and architectural and structural solutions of buildings constructed using 3D printing technology, principles, gaining practical skills in creating computer models-prototypes of construction objects using modern software and their implementation using 3D printing technology.
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 24 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The module grade is 100 points: - student work at lectures and practical classes - 28 points; - performing of individual tasks – 30 points; - control test - 42 points (maximum).
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module.
Preparatory course units	«Innovative building materials», «Technology of manufacturing and application of building mixtures»'
Educational material of reference	- Architectural, structural and technological system of 3D printing of building objects: a collective monograph / edited by prof. M.V. Savytskyi - Dnipro: 2019. - 270 p. - O. D. Manzhilevskyi, R. D. Iskovych-Lototskyi. Current additive 3D printing technologies. Features of practical application. Vinnytsia, 2021.–105p.

Name	Design of energy efficiency for buildings using the BIM model (optional course)
ECTS credits	4,0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: - know the basic principles and methods of energy efficient construction, - possess modern methods of designing energy efficient buildings using information modelling technologies.
Contents	The course «Design of energy efficiency for buildings using the BIM model» is aimed at studying the basic provisions and regulatory framework for energy efficiency in building design, best practices for creating passive buildings, buildings with almost zero energy consumption and active buildings; gaining practical skills in the selection of thermal insulation materials, analysis and optimisation of energy consumption based on the BIM model
Teaching and learning methods	40 hours in contact and online
Teaching techniques	Online Lectures 24 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The module grade is 100 points: - student work at lectures and practical classes - 28 points; - performing of individual tasks – 30 points; - control test - 42 points (maximum).
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is the grade for the content module.
Preparatory course units	«Materials science in construction » «Architecture of buildings and structures» «Technology of construction production»
Educational material of reference	- 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

Name	Computer 3D modelling of buildings and structures (optional course)
ECTS credits	3,0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: - use Solidwork to create geometric models. Modify geometric models using this software. - create parametric models of buildings and structures that automatically adapt to changes in input data. - perform structural analysis of geometric models to ensure their stability and reliability. Use a simulation programme to assess the behaviour of buildings under different loads and operating conditions. - implement sustainable building principles in geometric designs.
Contents	Geometric modelling of complex engineering systems requires the acquisition of appropriate skills. The calculation of various engineering systems of varying complexity makes it possible to fulfil the conditions for strength, stability and rigidity of the engineering system. The course «Computer 3D modelling of buildings and structures» provides the student with knowledge and skills in geometric modelling of complex buildings and structures and their elements in accordance with the functional requirements established for them.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 16 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The maximum grade is 100 points. The final test consists of two theoretical questions.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is calculated as the arithmetic average between the grades of the content modulei and the final test grade.
Preparatory course units	«Principles of BIM technologies», «Resistance of materials», «Theoretical mechanics», «'Construction mechanics»
Educational material of reference	- Koziar M.M., Feshchuk Yu.V., Parfeniuk O.V. Computer graphics: SolidWorks. Kherson, 2018. 252 p. - Volchok D.L. Development of methods of the theory of fuzzy sets in problems of structural mechanics and optimization of the design of structures under conditions of uncertainty. - Manuscript. Dnipro, 2024. 392 p.

Name	Parametric design of critical buildings and structures (optional course)
ECTS credits	3,0
Year / Semester	1/2
Specific learning outcomes	On successful completion of this module students should be able to: - use ANSYS and Solidworks software to develop geometric models. Modify geometric models using this software. - use parametric models to optimise design. - integrate new materials and technologies into parametric designs. - work in a team and communicate with other specialists using parametric models for collaboration.
Contents	Everyday life presents engineers with a wide variety of tasks related to the calculation of various engineering infrastructure structures of varying complexity in terms of geometry and materials. The course «Parametric design of critical buildings and structures» provides the student with the knowledge and skills to design complex buildings and structures and their elements in accordance with the functional requirements set for them and the laws of building physics.
Teaching and learning methods	32 hours in contact and online
Teaching techniques	Online Lectures 16 hours Practical classes in contact 16 hours
Methods of monitoring	Oral control, written control, practical control, as well as methods of self-control and self-assessment
Assessment criteria	The maximum grade is 100 points. The final test consists of two theoretical questions.
Assessment metrics	Final grade and exam grade
Criteria of attribution of the final grade	The final grade is calculated as the arithmetic average between the grades of the content modulei and the final test grade.
Preparatory course units	«Principles of BIM technologies», «Resistance of materials», «Theoretical mechanics», «'Construction mechanics»
Educational material of reference	- Koziar M.M., Feshchuk Yu.V., Parfeniuk O.V. Computer graphics: SolidWorks. Kherson, 2018. 252 p. - Hryshchenko V.M., Svirhun O.A., Kalinin Ye.I., Savchenko V.B. ANSYS' principles. Laboratory training: a manual. Kharkiv, 2020. 168p.

DEPARTMENT OF REINFORCED CONCRETE AND MASONRY STRUCTURES

Laboratories

Laboratory	Didactic Equipment	Work places / N. students per work place	Technical Staff
		30 / 2	*1 technician (9.30-14.30)*

DEPARTMENT OF REINFORCED CONCRETE AND MASONRY STRUCTURES

Library

Library of Department of Reinforced Concrete and Masonry Structures	
Bibliographical material of interest for the didactic activities of the Master	1. English in the Fields of Science and Research: https://englishlive.ef.com/blog/career-english/science-vocabulary/ 2. BIM Handbook A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors URL: https://hvacsimplified.in/wp-content/uploads/2022/05/4_5879807870286957058.pdf 3. Zhydkova T. V., Apatenko T. M. Building physics. Kharkiv, National Academy of Urban Economy named after O. M. Beketov. 2018. 405 p. 4. Nazarenko L.A., Ioffe K.I. Artificial outdoor lighting: Textbook for the course «Lighting of cities». Kharkiv, National Academy of Urban Economy named after O. M. Beketov. 2008. 122 p. 5. Engineering solutions for occupational safety in the development of diploma thesis for engineering and construction specialties / Edited by V. Safonov - Kyiv: Osnova, 2020 - 480 p. 6. State Building Code DBN A.3.2-2-2009 «Protection of labour and industrial safety in building construction» 7. A guide to the implementation of information modelling in construction, created by the European public sector: https://www.eubim.eu/wp-content/uploads/2020/12/2017_EU-BIM-Handbook_ua.pdf 8. BIM and ISO 19650: https://iceg.com.ua/wp-content/uploads/2019/11/EFCA_Flipbook_BIM_ukr_.pdf 9. - State Building Code DBN V.2.1-10:2018 Bases and foundations of buildings and structures. Main principles – Kyiv, 2018. 10. State Building Code DBN V.1.1-24:2009 Protection against hazardous geological processes. Main principles – Kyiv, 2010 11. State Building Code DBN V.2.6-98:2009 The constructions of buildings and structures. Concrete and reinforced concrete structures. Main principles. With Amendment No. 1 – Kyiv, 2020. 12. State Standard of Ukraine DSTU B V.2.6-156:2010 Structures of buildings and erections.Concrete and reinforsed concrete snructures with heavy weight structural concrete. Design rules – Kyiv, 2011. 13. - State Building Code DBN V.1.2-14-2018 General principles for realibity and constructive safety ensuring of buildings and civil engineering works. – Kyiv, 2018 14. State Building Code DBN V.2.6-198:2014 Steel structures. Design code. – Kyiv, 2018 15. Digital Agenda of Ukraine – 2020. https://ucci.org.ua/uploads/files/58e78ee3c3922.pdf

	16. Some issues of ensuring the functioning of the Unified State Electronic System in the field of construction, Cabinet of Ministers of Ukraine, resolution dated June 23, 2021 No. 681, Kyiv, https://zakon.rada.gov.ua/laws/show/681-2021-%D0%BF#n40 17. State Standard of Ukraine DSTU EN ISO 29481-1:2022. Building information models information delivery manual. Part 1: Methodology and format. 18. State Standard of Ukraine DSTU EN ISO 29481-2:2023 Building information models information delivery manual. Part 2: Interaction framework. 19. Zachko O. B., Ivanusa A.I., Kobylkin D.S. Project management: theory, practice, information technology. – Lviv, 2019. – 173 p. 20. State Building Code DBN A.3.1-5:2016 «Organization of construction production» - Kyiv, 2016 21. Barabash M.S. Computer modelling of life cycle processes of construction objects. Kyiv, 2014.-301 p. 22. Bilyk A.S. Environmental and economic analysis of the life cycle of building frames. Kyiv, 2022. – 263 p. 23. State Standard of Ukraine DSTU 9171:2021 Guidelines for ensuring a balanced use of natural resources in the design of structures. 24. State Building Code DBN V 2.5-64:2012 Internal plumbing and sewage system. Part I. Designing. Part II. Building 25. State Standard of Ukraine DSTU B A.2.4-41:2009 System of project documents for building. Heating, ventilation and air conditioning. Working drawings. 26. Architectural, structural and technological system of 3D printing of building objects: a collective monograph / edited by prof. M.V. Savytskyi - Dnipro: 2019. - 270 p. 27. O. D. Manzhilevskyi, R. D. Iskovych-Lototskyi. Current additive 3D printing technologies. Features of practical application. Vinnytsia, 2021.–105p. 28. State Building Code DBN B.2.6-31:2021 – Thermal insulation and energy efficiency of buildings 29. State Standard of Ukraine DSTU 9191:2022 Thermal insulation of buildings method for choosing of insulation material for insulation of buildings 30. Koziar M.M., Feshchuk Yu.V., Parfeniuk O.V. Computer graphics: SolidWorks. Kherson, 2018. 252 p. 31. Volchok D.L. Development of methods of the theory of fuzzy sets in problems of structural mechanics and optimization of the design of structures under conditions of uncertainty. - Manuscript. Dnipro, 2024. 392 p. 32. Hryshchenko V.M., Svirhun O.A., Kalinin Ye.I., Savchenko V.B. ANSYS' principles. Laboratory training: a manual. Kharkiv, 2020. 168p.
Web Connections	*Free Wi-Fi*
Services offered	*Books consultation, books borrowing, Scopus*
Opening time and access rules	*9.30-14.30*
Librarian staff available	*9.30-14.30*

Partnerships for carrying out training periods outside the University

#	Organization	Typology	Sector of Activity
1	REHAU LLC	Private Company	Production of polymer structures in the field of construction, automotive and industry.
2	VEKA LLC	Private Company	Production of window and door construction.
3	Vaillant LLC	Private Company	Production of engeneering equipment and systems.
4	"UDK" LLC	Private Company	Production of building materials
5	"BUDMEISTER" LLC	Private Company	Production of building materials
6	Private construction and assembly enterprise "STROITEL-P"	Private Company	Construction of residential and non-residential buildings
7	MAPEI Ukraine LLC	Private Company	Production of building materials
8	"HERTS Ukraine" SE	Private Company	Wholesale of building materials and sanitary-technical equipment
9	HENKEL BAUTECHNIK (Ukraine) LLC	Private Company	Production of building materials
10	BES company	Private Company	Design, Life Support Systems Engineering
11	"Dnepr ZBK" LLC	Private Company	Construction company
12	"PLANIT" LLC	Private Company	Design, Building structures, Life support systems, Top manager in a construction company that provides BIM services
13	LIRA SAPR LLC	Private Company	The owner of the company is a developer of BIM software for the construction industry
14	Service cooperative "Housing and building cooperative "AFFORDABLE HOUSING IN UKRAINE""	Private Company	Complex maintenance of objects
15	VEC company	Private Company	Design, Life Support Systems Engineering
16	ArCADiasoft company	Private Company	The emergence of the ArCADia BIM system is a logical consequence of the ArCADiasoft philosophy to meet the needs of designers at all stages of project development

Partnerships for carrying out training periods outside the University

#	Institution	Typology	Sector of Activity
1	The Ministry for Communities, Territories and Infrastructure Development of Ukraine (Ministry of Infrastructure)	Public Institution	The Ministry of Infrastructure is the main body in the system of central executive bodies, which ensures the formation and implementation of state policy: -in the field of improvement of settlements, housing and communal services, household waste management; -in the field of construction, urban planning, spatial planning of territories and architecture; -in the field of technical regulation in construction, pricing in construction; -in the field of restoration of regions, territories and infrastructure affected by the armed aggression of the Russian Federation against Ukraine; -in the field of architectural and construction control and supervision; -in the field of control of housing and communal services; -in the field of energy efficiency of buildings.
2	The Academy of Construction of Ukraine	Community organization	Development of the construction industry of Ukraine.